

Opinion

Theory of collective mind

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Theory of mind research has traditionally focused on the ascription of mental states to a single individual. Here, we introduce a theory of collective mind: the ascription of a unified mental state to a group of agents with convergent experiences. Rather than differentiation between one's personal perspective and that of another agent, a theory of collective mind requires perspectival unification across agents. We review recent scholarship across the cognitive sciences concerning the conceptual foundations of collective mind representations and their empirical induction through the synchronous arrival of shared information. Research suggests that representations of a collective mind cause psychological amplification of co-attended stimuli, create relational bonds, and increase cooperation, among co-attendees.

Representing 'our' awareness

The ability to represent mental states, or mentalize, is a hallmark of our species. However, the vast literature on this topic has focused almost exclusively on how people represent the mental states of others as divergent from one's own. Relatively unexplored is the human capacity to represent the mental states of others as convergent with one's own, what we describe as a **theory of collective mind** (see [Glossary](#)). Although there exists a voluminous literature on joint attention, it is largely focused on behavioral expression rather than on mental representation. In addition, whereas work on shared intentionality [1] and some second-person approaches [2] are exceptions to this rule, the dynamics of collective awareness have remained vague.

Over the past decade, building on work by philosophers [3–8], cognitive scientists have taken note (cf. [9]). Psychological scholarship that pertains to a mental representation of a collective mind has taken two distinct paths. One path is conceptual, articulating theoretical arguments for the necessity of collective mind representations (also known as we-representations) in human cognition, affiliation, and cooperation. The other path is empirical, identifying a social context, the **synchronous arrival** of information, in which collective mind representations are likely to emerge. Our goal here is to outline both approaches, linking the conceptual arguments for why, and the empirical conditions under which, representations of collective mental states impact human cognition, affiliation, and cooperation [10–18].

The culmination of our efforts is a framework that organizes the conceptual arguments and empirical evidence across two manifestations of collective mind: (i) when collective awareness is directed toward a common world; and (ii) when collective awareness is directed toward the group itself, allowing a form of collective self-awareness. The former are **representations of collective reality** that assure us that we experience a shared world together. The latter are **meta-cognitive representations** of collective psychology that assure us that we are collectively aware of our shared goals, beliefs, and feelings. A central claim of this review is that the distinction between collective reality and collective psychology is critical in understanding the impacts of collective mind representations on cognition and behavior.

Highlights

Theory of collective mind involves the individual's representation of a shared mental perspective, wherein the self and other converge in their experience. It is a mental representation of collective awareness of a common world and/or a common mind.

Information that is encoded in relation to a collective mind is psychologically amplified and prioritized in individual cognition.

Representing oneself as part of a collective mind strengthens relational bonds and increases cooperation, especially when it functions as both the origin and target of a representation.

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Collective mind: we ≠ you + I

The human tendency to represent and theorize about mental states has captivated researchers for nearly half a century (e.g., [19,20]). Although it is a complex concept that covers multiple cognitive and affective processes [21], a **theory of mind** represents an agent's (hidden) mental states as the cause of its behavior. Theory of mind scholarship has traditionally focused on how this capacity to mentalize allows people to differentiate the contents of other minds from their own [22]. Indeed, it has been argued that a theory of mind can only be validly assessed when a target agent's mental states diverge from one's own [23]. What has consequently been ignored in much of this literature are instances in which individuals theorize collective or shared mental states, wherein the capacity to mentalize allows one to track the convergence between the contents of one's own mind and that of others'. Whereas a **theory of an individual mind** requires differentiation between one's personal perspective and that of another agent, a theory of collective mind requires perspectival unification across agents. The latter is a mental representation of what the collective self knows, thinks, feels, wants, and believes (Table 1).

A theory of collective mind reflects the experience of ascribing mental states to a collective agent. Much like in traditional theory of mind research, it is considered a 'theory' because it involves inferences about hidden mental states that are not experienced directly. It is considered collective because it is attributed to a plurality of minds. This plurality ranges from creating collective representations with individual interaction partners to collective representations that are believed to be shared across entire (e.g., cultural) groups.

As stated earlier, we distinguish representations of collective mind that involve external, in-the-world stimuli (e.g., 'We are aware of this tree'), and representations of collective mind that involve internal, in-the-mind stimuli (e.g., 'We are aware that we like this tree') [17]. The former are representations of collective reality that assure us that we are collectively aware of a shared world. Here, collective mind is confined to the **origin of a representation**, there is **epistemic confidence** as to what 'we' know and, therefore, what 'we' know is prioritized in individual cognition, motivation, emotion, and behavior. Such collective mind representations need not be motivated by considerations of what is good for the collective; individuals who do not care about the good of the group can still benefit from prioritizing collectively shared representations, because they improve coordination with other social agents. For example, knowing that 'we are aware of this tree' facilitates coordination with others by establishing a shared object of experience that can be referenced in communication.

Table 1. Theory of individual mind versus theory of collective mind

	The capacity to mentalize	
	Theory of individual mind	Theory of collective mind
Differences	A representation of the mental state of a single individual	A representation of the mental state of a self-inclusive collective
	Tracks divergence in mental states between self and other(s)	Tracks convergence in mental states between self and other(s)
	Allows for prediction and interpretation of others' behavior	Allows for epistemic confidence in knowing, interpreting, and acting together
Similarities	A mental representation that can be accurate or inaccurate	
	A mental representation with a particular perspective at its origin (e.g., 'She is aware of X'; 'We are aware of Y')	
	A mental representation of agentic awareness, intention, emotion, belief, or attitude	

Glossary

Epistemic confidence: confidence in knowing something without doubt.

Meta-cognitive representations: mental representations of mental representations.

Mind-in-mind recursion: two agents attempting to ascertain each other's knowledge will always encounter epistemic doubt with higher levels of recursive awareness (A knows that B knows X, but does B know that A knows that B knows X, etc.).

Origin of a representation: the 'who' of a representation, or the agent doing the representing.

Prisoner's Dilemma: two-player economic game in which joint cooperation is better for both players than joint defection, but defection is a dominant strategy for each individual player.

Representations of collective psychology: representations in which the group's shared mental states are the targets of a collective mind (e.g., 'We are aware that we like the tree'). Here, the collective mind is both the subjective origin and objective target of representation.

Representations of collective reality: representations in which in-the-world stimuli are targets of a collective mind (e.g., 'We are aware of the tree'). Here, the collective mind is the subjective origin of a representation, while external stimuli are the objective targets of representation.

Stag Hunt: two-player economic game in which the players are motivated primarily to cooperate by coordinating their strategies on a jointly optimal equilibrium, but cooperation also risks the worst payoff if the co-player does not also cooperate.

Synchronous arrival: experience of perceiving the same information at the same time as other people; regarded as an important precursor of collective mind theorizing.

Target of a representation: the 'what' of a representation, or the target of reflection.

Theory of an individual mind: synonymous with theory of mind as it is typically researched; the capacity to differentiate between one's personal perspective and that of another agent.

Theory of collective mind: capacity to ascribe a unified mental state to a self-inclusive group of agents; an individual's mental representation of a shared mental perspective or state,

However, when the collective mind is the origin and **target of a representation**, collective psychology takes center stage: group feelings, desires, and plans gain paramount importance. Here, meta-cognitive **representations of collective psychology** assure us that group members are collectively aware of our shared goals, beliefs, and feelings. For example, knowing that ‘we are aware that we like this tree’ leads to the prioritization of collective attitudes toward the tree, encouraging psychological cohesion within the group. It is in this more self-reflective context that collective interests overshadow individual interests, encouraging behaviors that benefit the collective, even at the expense of the individual (Table 2, Key table).


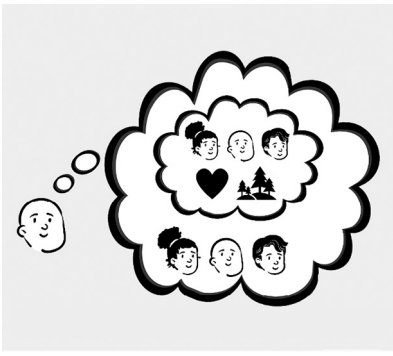
wherein the self and other converge in their experience, forming a unitary, but plural perspective on in-the-world stimuli and/or mental states.
Theory of mind: capacity to mentalize, ascribing mental states to an agent.

Why do we need a theory of collective mind?

Irrespective of whether they strive to benefit their individual selves or their groups, humans frequently do so via cooperation; that is, humans tend to work together whether they want to gain individual benefit or increase the well-being of their community. In evolutionary terms, human cooperation appears to be flexible, having potential roots in both individual and group selection [24,25].

Whether benefiting the individual or the group, human cooperation requires common knowledge [13,26–31], wherein the agents involved not only have the same knowledge, but also know that they do, know that they know that they do, and so on *ad infinitum* [32]. Common knowledge is generally thought to be a product of public information, in which it is apparent to all that everyone knows said information. Yet, the critical question for cognitive science is: what cognitive capacities assure would-be cooperators that public information is indeed common knowledge?

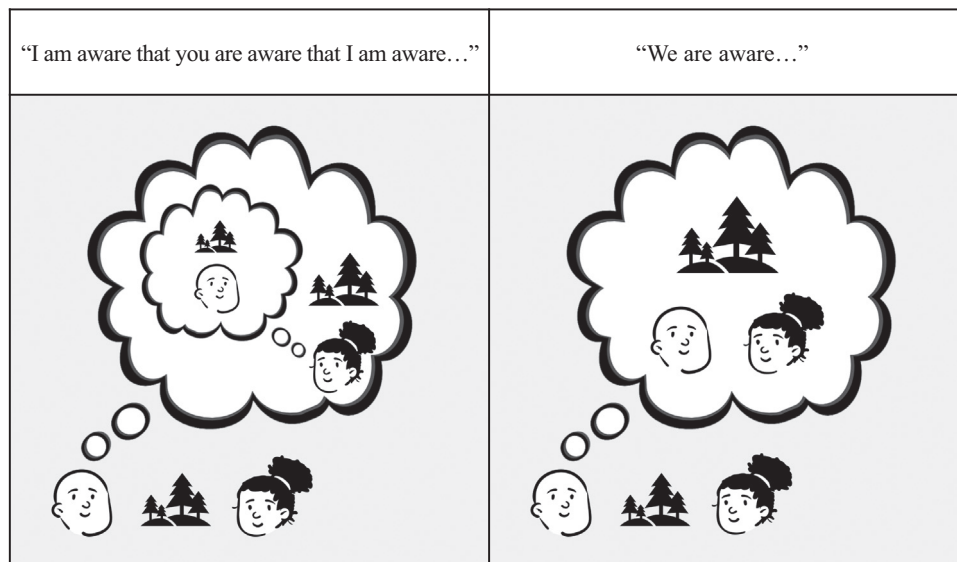
Table 2. Key table. Collective mind: conceptual framework and empirical findings

	Collective reality (collective awareness of the world)	Collective psychology (collective awareness of the collective)
Theoretical foundations		
Structure of the representation	‘We are aware of X’ 	‘We are aware of how we feel about X’ 
Conceptual claims	Enables confidence in, and focus on, collectively encoded information	Enables confidence in, and focus on, collective mental states
	Enables cooperation when it benefits the individual	Enables cooperation when it benefits the group (even at a potential cost to the individual)
	Empirically induced by synchronous experience of external information	Empirically induced by synchronous experience of collective mental states
Empirical findings		
Individual cognition	Psychological amplification of collective information	Confidence in the contents of collective mental states
Social bonding	Mild social bonding	Strong social bonding
Cooperative choice	Cooperation when it benefits the individual (e.g., Stag Hunt)	Cooperation when it benefits the group at a potential cost to the individual (e.g., Prisoner’s Dilemma)

Recent social cognitive theories [10,17,18] converge with game-theoretic developments in economic psychology [11] to suggest that the most well-researched accounts of how we come to understand the minds of others are not up to the task. Given that prediction-based models [33], simulation-theory of mind [34], and theory-theory of mind [35] have focused on understanding distinct minds in interaction, they are all susceptible to **mind-in-mind recursion** (e.g., ‘I know that you know that I know...’), which can exhaust attentional resources and lead to inconclusive inferences. Despite the fact that mind-in-mind recursion is important for human communication and cooperation [36,37], it introduces an inherent degree of uncertainty when interacting agents try to dynamically assess their common knowledge in the moment.

By contrast, a theory of collective mind, wherein information is represented from the perspective of a unitary, self-inclusive collective, grants individuals the epistemic confidence of knowing something together. Thus, collective mindedness, the representation of what a collective mind knows (e.g., ‘We are aware of the tree’), precludes the mind-in-mind recursion and concomitant uncertainty of you-I representations (e.g., ‘Are you aware that I am aware of the tree?’), therefore limiting doubt about what we know together (Figure 1).

In theories of team reasoning [11], collective mind explains how players converge on payoff-dominant outcomes in coordination games, which is otherwise puzzling from a game-theoretic perspective [38]. In coordination games, players receive the largest payoff if they jointly choose the cooperative option. However, the solution to these games is formally indeterminate, because the cooperative strategy is not unconditionally optimal, and neither player has any rational basis for anticipating their partner’s choice [27]. Therefore, one might expect people to prioritize individually securable payoffs over collectively attainable outcomes that feature more risk. Yet, people frequently choose to cooperate. Why? Team reasoning posits that representations of collective mind alter the unit of agency from the individual to the group of players. Whereas in orthodox



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Figure 1. Structure of I-you recursive representations versus we-representations. The left panel depicts how common knowledge is attained with a theory of individual mind, requiring higher-order recursive representations of each person’s mental states and their presumed inferences about the other’s mental states. The right panel depicts how common knowledge is attained with a theory of collective mind, involving a computationally simpler first-order representation of the collective’s unified mental state.

game-theoretic reasoning, a player asks, ‘What do I want?’ and ‘What should I do to achieve this?’, a player who has represented a collective mind asks, ‘What do we want?’ and ‘What should I do to play my part in achieving this outcome?’; that is, each player seeks to identify an outcome that is best for the group of players as a whole and plays the corresponding strategy if that outcome is unique [39–41], explaining the intuitive appeal of cooperative solutions across many strategic interactions [42–47].

The importance of collective mind representations is also seen during cooperative communication, defined as the use of communicative acts to align mental states across agents [48]. Recent accounts of this field argue that humans have an adaptive prior belief that mental states will be shared across collaborative partners [49]. It is in the context of this prior expectation for a shared perspective that communicative partners continually tailor their word choice to disambiguate the mental states of others, hoping to establish or reaffirm the common ground among speakers. By contrast, situations in which communicative partners fail to achieve a shared understanding are experienced as frustrating and aversive. By this account, the human tendency to represent a shared perspective with others is a critical part of the communicative processes that support cooperative action.

Arguably, the capacity to represent a collective mind as the origin of a perspective (i.e., ‘We are aware of X’) may have evolutionary underpinnings in individual-selection mechanisms, because it enables cooperation for the benefit of each individual. Conversely, the capacity to represent a collective mind as both the origin and target of a perspective (i.e., ‘We are aware of us’) may have evolved through group-selection mechanisms, because it enables cooperation for the benefit of the group as a whole [24,25,50]. Together, these capacities have been argued to underpin the development of social identities or categories that sustain cooperation across time and space, serving as a powerful cognitive tool for the emergence of complex societies [15] (Box 1).

Box 1. Collective mind and social identity

Under the social identity approach, humans categorize themselves within a set of identity groups, each of which has stereotyped characteristics and expectations [110–112]. The salience of these identities fluctuates with category-relevant cues in the social environment, producing a dynamic distinction between ‘ingroup’ and ‘outgroup’ members. Even when these groups are assigned arbitrarily, people are generally biased toward ingroups and against outgroups [113].

Social identities are likely to shape inferences about mental state convergence, because salient cues to another agent’s outgroup membership will reduce expectations for self-similarity and thereby decrease the likelihood of representing a shared perspective. Even arbitrarily assigned group memberships can reduce empathic mirroring of outgroup members, making it harder to intuitively share affective states with them [114,115]. Similarly, people tend to engage in less perspective-taking with outgroup members, leading to reduced accuracy in cross-group mental state inferences [116] that may interfere with perspectival convergence.

By contrast, ingroup members are expected to share a set of core characteristics, and the prior expectation of self-similarity around these traits will encourage inferences about mental state convergence. Indeed, there is evidence that synchronous co-experiences may have stronger psychological impacts when they are co-experienced with ingroup rather than outgroup members [67]. Prior knowledge of a social category and its associated norms can also shape the inferences that emerge during mentalizing to be more stereotypically congruent with a target’s identity category [51]. If an agent lacks prior knowledge about a group, they will have to rely on available cues to guide their mental state inferences.

Social identities can also be affected by meta-cognitive representations of collective psychology, which emerge when the collective mind directs its attention toward its own mental states. The collective self-representations that emerge from this process are believed to define and update the stereotyped expectations associated with an active social identity [17]. In other words, shared experiences of collective psychology define group norms by incorporating the group’s mental states into common ground (e.g., collectively perceiving that ‘we are angry about X’ leads to the stereotyped expectation that other ingroup members will also express anger toward X) [18]. Activation of a salient social category can also influence behavioral self-regulation to be more identity congruent, even when the category is activated outside of the collective experiences that initially defined it [117]. Taken together, social identity and categorization processes are functionally distinct from collective mentalizing, but these mechanisms nonetheless interact to shape social behavior [18].

Collective mind representations in empirical research

Empirical induction of 'our' awareness

Inferences about mental states can be understood as a process of statistical learning that combines prior beliefs about an agent with salient perceptual cues [51]. The mental states that are inferred through this process are those that appear most likely given the available cues and prior expectations. Extending this framework to the current topic suggests that prior expectations and perceptual cues can also facilitate inferences of collective awareness. Thus, the likelihood of collective mind representations should increase with perceptual cues that indicate a similarity of perspectives across agents. Here, we focus on one particularly powerful cue to perspectival merging: the synchronous experience of the same stimuli.

The relationship between synchronous experience and representations of collective mind has been studied most extensively in joint action paradigms [52]. Moving in synchrony with others has been shown to enhance the sense of joint agency [53], where the locus of action is no longer the solitary individual ('I did that') but is instead shifted to the collective ('We did that'). Research suggests that the relative emphasis on personal or collective agency in these contexts will depend on the salience of cues for disambiguating self and other [54]. For example, if all group members perform identical actions in synchrony, they are more likely to establish a sense of we-agency than when they perform complementary actions together or identical actions asynchronously. Synchronized actions tend to result in a blurring of the distinction between self and other [55] and a concomitant boost in the feelings of socially entitative 'we-ness' [56–59].

In the sections below, we review empirical studies that take the complementary approach of inducing synchronized experience instead of synchronized action. This literature compares the psychological effects of synchronous versus asynchronous stimulus presentation. It is theorized that the synchronous arrival of public information across agents is a cue for perspectival convergence, creating a fertile ground for collective mind representations (i.e., 'We are aware of X'). By contrast, the asynchronous delivery of information is more likely to engage theories of individual mind because it provides an inherent cue to epistemic divergence (e.g., 'I know that you will find out later'; 'You already knew what I just learned'). As such, we should expect that synchrony in experience is more likely to blur self–other distinctions and yield collective representations.

Empirical findings suggest that this is indeed the case. People discussing a popular show on social media are more likely to use first-person plural pronouns, such as we, us, our, or ours if they post during the live broadcast when everyone is watching synchronously. By contrast, first-person singular pronouns, such as I, me, and mine, are used more when posted asynchronously after the broadcast [60]. Synchronous sensory stimulation across agents can also induce a sense of self–other merging that does not occur following asynchronous sensory stimulation [61]. Thus, the proposed distinction between 'I–you' and 'We' representations transcends the grammatical, extending to the epistemic structure of the represented perspective (Figure 1) and producing distinct psychological consequences. Notably, the greater likelihood of collective mind representations during the synchronous arrival of information does not preclude the possibility of theorizing distinct minds in respect to distinct content (e.g., 'We are all aware of X, but only I know Y'). More generally, it is likely that representations of individual and collective mental states can work in tandem to guide social behavior [52] (Box 2).

As we summarize next, experiencing information synchronously yields the cognitive amplification of shared information, a mild increase in social bonding, and increases in cooperation when it benefits the individual. Additionally, synchronous arrival of information about 'our' common mental state through verbal communication and/or mutual eye gaze yields greater epistemic certainty

Box 2. Mental state convergence: alignment or merging?

Mental convergence can be represented in two ways: (i) the alignment of mental states across distinct individuals; and (ii) the merging of mental states into a single collective agent. Alignment involves a meta-cognitive comparison of each individual's inferred mental state, while retaining clear identity boundaries between self and other ('you' and 'I'). By contrast, merging occurs when cues to experiential similarity are more salient compared with cues to self/other distinction, such as during highly synchronized activities or in deindividuating crowd settings [52,118]. Here, the sense of being a collective ('we') is more salient than one's personal identity.

Although both types of mental convergence can facilitate coordination, they do so in different ways. Alignment emerges through the imitation of other group members [119] and is supported by externalized symbols and practices that reinforce cultural norms and worldviews [120]. Notably, this alignment can emerge without representing a unified group perspective. By contrast, the merging of self and other involves the experience of psychological unity across agents [121,122], thus constituting a theory of collective mind.

It is important to recognize that, although alignment and merging are phenomenologically distinct [53], they need not be mutually exclusive. A group of agents may infer themselves to be merged for some aspects of a synchronous experience (e.g., we all see the same movie), aligned for other aspects (e.g., each one of us likes the story), and misaligned for others (e.g., only I like the acting). This is consistent with social cognitive research in which personal and collective identities can be activated independently or in parallel to shape an agent's experience and self-construal [111]. Thus, the continuum of shared experiences ranges from those that maximally distinguish personal identities to those that maximally emphasize deindividuation and group cohesion [54]. Of course, the bulk of our social experiences lies somewhere between these extremes, with personal and collective modes of representation working in parallel to flexibly demarcate areas of common and uncommon ground [17].

Although there is empirical evidence that synchronous co-experiences can induce a sense of self/other merging [55,57,60,61], this will likely vary with salient cues to personal and collective identity. Experimentally manipulating the relative salience of these cues during synchronous experiences would help to disambiguate the contributions of merging and alignment to subsequent outcomes. Likewise, designs that include implicit or explicit measures of self/other merging during synchronous experiences will help to shed light on this issue.

about that mental state, a strong increase in social bonding, and greater cooperation when it benefits the group. In all, synchronous co-experiences yield cognitive, affiliative, and cooperative outcomes that are consistent with the idea that such co-experiences foster collective mind representations.

Collective mind and individual cognition

Collective reality

Representing the collective mind as the origin of experience should produce psychological effects centered on the amplification of collectively attended content. Studies suggest that this is indeed what occurs following the synchronous arrival of information. For instance, using a modified shape–label matching task, researchers found that being assigned to a social group leads to the cognitive prioritization of information that is relevant to the collective, even in the absence of an explicit collaborative goal [62]. Indeed, the use of the pronoun 'we' was enough to yield a processing benefit (Study 3 [62]). This prioritization of collective representations helps to facilitate task performance even when the specific roles of individual actors are unknown [15,62], suggesting that we-representations can be independent of I/you-representations in their influence on cognition.

Experiments also show that gustatory [63] and visual [64] experiences are psychologically amplified when they are simultaneously co-experienced with others. This was particularly the case when co-experiencers were relationally close or physically proximate, conditions under which perspectival convergence and collective mind theorizing (i.e., we are tasting the chocolate/viewing the scene) are most likely [65]. Along these lines, experiments [66] have shown that co-experience with physically present others amplified learning as measured by retrieval accuracy and EEG indexes of implicit learning compared with co-experience with physically distant others and with solo experience.

Similarly, other studies have focused on how memory [67], emotion [68] (although see [69]), motivation [70], persuasion [71], and behavioral learning [72] are psychologically amplified when relevant stimuli are simultaneously co-experienced with relationally closer others. Under synchronous (vs. asynchronous) co-experience, words had better recall, pleasant stimuli led to more joy (whereas unpleasant stimuli led to more fear and sadness), instructions were more ardently followed, persuasive messages were more persuasive (whereas unpersuasive messages were less persuasive), and watching behavior led to greater learning of that behavior.

Remarkably, during synchronous co-attention to a short lesson, measures of brain–brain synchrony across students predicted long-term memory better than did measures of individual brain activity [73]. This is consistent with the idea that synchronously co-experienced information is encoded more deeply. Similarly, research finds that co-experiencing emotional faces leads to amplification of their neural processing [74] (although see [75] for null results), and that children allocated more resources to encoding a televised message when co-watching with a parent [76]. This enhanced cognitive resource allocation was also associated with higher arousal levels [77]. Enhanced memory has likewise been shown in shared experience paradigms even when the partner's sensorimotor cues cannot be directly observed [78], suggesting that collective mind representations involve inferential thinking.

Studies on the sharing-is-believing effect find that, when an individual tunes their description of a target person to their audience's attitude (e.g., describing the target positively if their audience likes the target), they are more likely to later align their recall of the target with the audience's attitude. Conversely, attitudinal recall is diminished when they believe that their audience did not agree with their message as being about the specific target [79], when they believe that the audience was not to be trusted [80], or when they believe that the audience did not receive their description [80]. It is theorized that knowing one's description was received facilitates a sense of connection to the audience [12,81], wherein the individual represents their personal attitude expression as the common knowledge of a collective mind (e.g., 'We know what I think' [17]). Notably, when one's attitude closely matches that of the audience, it is possible that the communication of this shared attitude may induce a representation of collective metacognition (e.g., 'We are aware of our attitude'), increasing social affiliation as a result [82].

Collective psychology

The above studies demonstrate the psychological amplification of content that is represented in relation to a collective mind. However, when the collective mind turns its attention toward its own psychological state, it becomes the origin and target of the representation. In such cases, we should expect greater epistemic certainty in the co-experienced mental state. An example is the experience of generalized shared reality: the subjective experience of sharing thoughts, feelings, and beliefs about the world at large. Participants in these studies are not only attending to external stimuli together, but also jointly attending to their common psychological reactions. Here, dyads who experience greater generalized shared reality during conversation subsequently report higher feelings of epistemic certainty about the mental content within the interaction as part of a collaborative sensemaking process [83].

Collective mind and social bonding

Collective reality

In addition to the cognitive effects described above, representations of collective mind may also have important implications for affiliative behavior, boosting the experienced relational closeness between agents. It is possible that greater confidence in sharing a common objective reality yields mild increases in psychological closeness, because future cooperation is more likely to succeed.

For instance, participants who complete a reaction time task while sitting next to another participant watching the same screen feel greater psychological closeness only when they co-attend to the same (vs. different) stimuli [84], even when they were instructed not to communicate. Other research in which participants synchronously (vs. asynchronously) co-attended something showed that this effect appears to be particularly strong when experiencing belief affirming stimuli [85]. Thus, co-experiencing the same stimuli during an experimental task is enough to produce a small increase in social bonding among participants, over and above any effects of social proximity without co-experience.

This effect emerges at a young age, with 2.5-year-olds being faster to approach a novel adult with whom they co-watched a film [86], even when the adult is instructed not to communicate with the child during the interaction. Similar effects are observed in chimpanzees and bonobos, which are faster to approach other apes, and humans who co-watched the same film, staying physically closer to them afterward [87], suggesting that, in addition to understanding the attention [88,89], intentions [90], and perhaps even beliefs [91] of others, great apes might also create a basic form of collective representation. Overall, what these studies suggest is that representing oneself as part of a collective mind with strangers will give a small boost to relational bonds among co-attendees.

Collective psychology

When collective mind is not only the origin of a representation, but also its represented target, we should expect strong increases in psychological closeness. Accordingly, studies find that communicative eye contact in response to the onset of a jointly attended stimulus (compared with the eye contact occurring later in the procedure, unrelated to a shared experience) leads to social closeness in human children, but not in apes [92]. Crucially, in the control condition, the children were still observing their partner going through a similar experience. It is possible that such mutual eye gaze in human children not only indicates that an event is co-experienced, but also serves as an invitation to the human child to join the shared experience, suggesting that the partner and the child are co-experiencing their fledgling bond (a shared mind) [93]. Indeed, in adults, mutual gaze marks the apex of pupillary synchrony as well as feelings of engagement during a conversation [94]. If the eyes are the windows to the soul, mutual gaze provides a shared view.

Similarly, experiments have shown that, when two people synchronously co-experience themselves having the same subjective reaction to an abstract question (e.g., 'If Whoopi Goldberg was a plant, would she be a red rose or a dried flower?'), they feel closer to their partner [16]. Interestingly, this is also the case with partners who belong to stigmatized outgroups, suggesting that collective mind representations can be a means of transforming historic animosities into alliances. It is possible that the bonding effects of enjoying a meal together [95], particularly when eating from the same plate [96], and more generally when sharing consumption [97], fall within the same category of experience, and engender cooperative behavior. Likewise, increases in affiliative behavior due to interpersonal synchrony [98–102] may be due to a mental representation wherein a collective mind serves as both an origin ('We are aware of...') and a target of experience ('...our intentional synchrony'). Other studies have found that shared dysphoric experiences, where everyone is aware of each other's emotional reactions, are particularly bonding [103,104]. Failure to socially cohere in the face of a common threat can be more perilous to survival compared with failure to socially cohere in the face of joint victory. Similarly, co-experiencing intense negative affect has been found to increase group cohesion [105].

Finally, in the study of generalized shared reality [83], researchers find that experimentally induced threats to shared subjectivity lead to verbal behaviors to reaffirm a sense of inner state commonality ('I totally agree'; 'Exactly!'). Close partners with high generalized shared reality described their

minds as ‘merged’, a fitting account of a collective mind that is both the origin and target of a representation. Intriguingly, the representation of a collective mind as origin and/or target of a representation may be compromised in autism [106].

Collective mind and cooperative choice

Collective reality

Given that collective mind representations grant people increased confidence in knowing something together, they should be particularly impactful when common knowledge is critical to cooperation. In an examination of how common knowledge influences cooperative choice [107], researchers had two participants play a pure coordination game, where mutual cooperation produced the largest payoff for each individual (e.g., a **Stag Hunt** game). Whereas only about one in five people chose to cooperate when the payoff information was delivered privately, more than four in five people chose to cooperate when the payoff information was delivered publicly, a situation in which participants could more readily represent the information as the target of a collective mind (i.e., ‘We all know that each of us would be better off cooperating’). Critically, in nested ‘I–you’ knowledge conditions, wherein a given participant knew that the other participant also knew about the payoff structure (secondary knowledge), and in addition, that the other participant also knew that the given participant knew about the payoff structure (tertiary knowledge), cooperation was still significantly lower than in the public knowledge condition wherein we-representations were more likely. These findings suggest that the public delivery of information that addresses multiple individuals as a single collective mind quadruples cooperative choice.

Collective psychology

Whereas confidence in common knowledge increases cooperation when it is individually beneficial (e.g., in a Stag Hunt game), common knowledge of a shared psychology foregrounds the interests of the collective, increasing cooperation when it can be individually risky. For instance, investigating cooperative behavior in a **Prisoner’s Dilemma** study [108], researchers found that cooperation was considerably lower for participants who co-experienced the same subjective reaction to an inkblot asynchronously (with a 10-s delay) compared with synchronously. According to our account, only the latter participants represented their collective awareness of their shared mental state (i.e., ‘We are aware of us’), leading to more epistemic certainty in their shared psychology, foregrounding collective interests and backgrounding individual ones. This is distinct from the Stag Hunt studies [107], wherein the public delivery of payoff information allowed for a collective mind as the origin, but not as the target, of a representation (i.e., ‘We are aware of the payoffs’), leading to more epistemic certainty in shared objective facts, but not in the existence of a collective agent with particular mental states.

Consistent with the possibility that mutual eye gaze indicates a collective awareness of a shared mind, research has shown that communicative eye contact increases cooperative behavior in a Prisoner’s Dilemma relative to a situation in which eye contact was not possible [109]. More recent research with children went one step further by showing that 5- to 7-year-old children interpreted a communicative look (but not a non-communicative look) from an adult experimenter as a commitment to cooperate, as reflected by their explicit verbalization of this expectation, and their increased protests when the adult subsequently did not cooperate [93]. Both studies suggest that successful communication exchanges, even as minimal as communicative eye contact, can create representations of collective metacognition that subsequently increase cooperative behavior and decision-making.

Concluding remarks

The human ability to cooperate is as important as it is complicated (see [Outstanding questions](#)). Recent theoretical and empirical research suggests that humans often represent a collective

Outstanding questions

Does a Theory of Collective Mind depend on the same neurocognitive mechanisms as individual Theory of Mind? Do they follow the same developmental trajectory? Are there any additional mechanisms that are recruited to distinguish the representation of collective and individual minds?

To what extent do representations of collective mind emerge when agents are alone? Although collective mind representations are most salient when co-attending events with others, do they have any functional implications outside of these social contexts? What role do they have in sustaining one’s identity and sense of self?

What is the prevalence of collective representations? How frequently do people experience these representations compared with individual representations? Do some people experience collective representations more than others? Are some cultural contexts more conducive to the representation of collective versus individual minds?

What are the best ways to directly manipulate and measure collective mind representations? How are the contours of the collective mind shaped by perceptual cues? Are there any cognitive markers that can discern representations of collective and individual mental contents?

How might a Theory of Collective Mind help to explain intergroup behavior and group cognition? Do people spontaneously attribute a collective mind to members of the same social category? Could these representations be a useful target for changing intergroup attitudes? How might the dynamics of collective mind representations change when the self is not part of the collective (i.e., ascribing a unified mental state to ‘them’)?

mind, both as the perspectival origin (collective reality) and its target (collective psychology). When the collective mind is the represented origin, characteristics of 'our' shared world are psychologically and behaviorally prioritized, facilitating 'individually' beneficial cooperation. When the collective mind is also the represented target, the collective mind itself is psychologically and behaviorally prioritized, facilitating collectively beneficial cooperation. In all, theories of collective mind can engage and direct human psychological capacities toward common worlds and common minds, with the choice of whether to cooperate in the balance.

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Declaration of interests

No interests are declared.

References

1. Tomasello, M. *et al.* (2005) Understanding and sharing intentions: the origins of cultural cognition. *Behav. Brain Sci.* 28, 675–691
2. Moore, C. and Barresi, J. (2017) The role of second-person information in the development of social understanding. *Front. Psychol.* 8, 1667
3. Tuomela, R. (2007) *The Philosophy of Sociality: The Shared Point of View*, Oxford University Press
4. Olick, J.K. (1999) Collective memory: the two cultures. *Sociol. Theory* 17, 333–348
5. Gilbert, M. (1989) *On Social Facts*, Routledge
6. Schmid, H.B. (2014) Plural self-awareness. *Phenomenol. Cogn. Sci.* 13, 7–24
7. Searle, J.R. (1995) *The Construction of Social Reality*, Free Press
8. Schmitz, M. (2018) Co-subjective consciousness constitutes collectives. *J. Soc. Philos.* 49, 137–160
9. Gallotti, M. and Frith, C.D. (2013) Social cognition in the we-mode. *Trends Cogn. Sci.* 17, 160–165
10. Chater, N. *et al.* (2022) The paradox of social interaction: shared intentionality, we-reasoning, and virtual bargaining. *Psychol. Rev.* 129, 415
11. Colman, A.M. and Gold, N. (2018) Team reasoning: solving the puzzle of coordination. *Psychon. Bull. Rev.* 25, 1770–1783
12. Echterhoff, G. and Higgins, E.T. (2021) Shared reality: motivated connection and motivated cognition. In *Social Psychology: Handbook of Basic Principles* (Lange, P.A.M. *et al.*, eds), pp. 181–201, Guilford Press
13. Freitas, J. *et al.* (2019) Common knowledge, coordination, and strategic mentalizing in human social life. *Proc. Natl. Acad. Sci. U. S. A.* 116, 13751–13758
14. Higgins, E.T. *et al.* (2021) Shared reality: from sharing-is-believing to merging minds. *Curr. Dir. Psychol. Sci.* 30, 103–110
15. Kourtis, D. *et al.* (2019) Evidence for re-representations during joint action planning. *Neuropsychologia* 131, 73–83
16. Pines, E.C. *et al.* (2018) More about when I's meet: the intergroup ramifications of I-sharing, part II. *Pers. Soc. Psychol. Bull.* 44, 1601–1614
17. Shteynberg, G. *et al.* (2020) Shared worlds and shared minds: a theory of collective learning and a psychology of common knowledge. *Psychol. Rev.* 127, 918–931
18. Shteynberg, G. *et al.* (2022) Agency and identity in the collective self. *Personal. Soc. Psychol. Rev.* 26, 35–56
19. Frith, C. and Frith, U. (2005) Theory of mind. *Curr. Biol.* 15, 644–645
20. Premack, D. and Woodruff, G. (1978) Does the chimpanzee have a theory of mind? *Behav. Brain Sci.* 1, 515–526
21. Schaafsma, S.M. *et al.* (2015) Deconstructing and reconstructing theory of mind. *Trends Cogn. Sci.* 19, 65–72
22. Deschrijver, E. and Palmer, C. (2020) Reframing social cognition: relational versus representational mentalizing. *Psychol. Bull.* 146, 941
23. Quesque, F. and Rossetti, Y. (2020) What do theory-of-mind tasks actually measure? Theory and practice. *Perspect. Psychol. Sci.* 15, 384–396
24. Wilson, D.S. and Wilson, E.O. (2007) Rethinking the theoretical foundation of sociobiology. *Q. Rev. Biol.* 82, 327–348
25. Wilson, D.S. *et al.* (2008) Multilevel selection theory and major evolutionary transitions: Implications for psychological science. *Curr. Dir. Psychol. Sci.* 17, 6–9
26. Hume, D. (1739) *A Treatise of Human Nature*, John Noon
27. Schelling, T.C. (1960) *The Strategy of Conflict*, Harvard Univ. Press
28. Lewis, D. (1969) *Convention: A Philosophical Study*, John Wiley & Sons
29. Clark, H.H. (1985) Language use and language users. In *Handbook of Social Psychology* (Lindzey, G. and Aronson, E., eds), pp. 179–231, Random House
30. Friedell, M.F. (1969) On the structure of shared awareness. *Behav. Sci.* 14, 28–39
31. Tooby, J. and Cosmides, L. (2010) Groups in mind: the coalitional roots of war and morality. In *Human Morality and Sociality: Evolutionary and Comparative Perspectives* (Hogh-Olesen, H., ed.), pp. 91–234, Palgrave-Macmillan
32. Vanderschraaf, P. and Sillari, G. (2022) Common knowledge. In *The Stanford Encyclopedia of Philosophy (Fall 2022)* (Zalta, E.N. and Nodelman, U., eds), Stanford University
33. Tamir, D.I. and Thornton, M.A. (2018) Modeling the predictive social mind. *Trends Cogn. Sci.* 22, 201–212
34. Goldman, A.I. (2006) *Simulating Minds: The Philosophy, Psychology, and Neuroscience of Mindreading*, Oxford University Press
35. Gopnik, A. and Wellman, H.M. (1992) Why the child's theory of mind really is a theory. *Mind Lang.* 7, 145–171
36. Moore, R. (2017) Gricean communication and cognitive development. *Philos. Q.* 67, 303–326
37. Siposova, B. and Carpenter, M. (2019) A new look at joint attention and common knowledge. *Cognition* 189, 260–274
38. Harsanyi, J.C. and Selten, R. (1988) *A General Theory of Equilibrium Selection in Games*, MIT Press
39. Bacharach, M. (1999) Interactive team reasoning: a contribution to the theory of co-operation. *Res. Econ.* 53, 117–147
40. Bacharach, M. (2006) *Beyond Individual Choice: Teams and Frames in Game Theory*, Princeton University Press
41. Sugden, R. (1993) Thinking as a team: towards an explanation of nonselfish behavior. *Soc. Philos. Policy* 10, 69–89
42. Bardsley, N. *et al.* (2010) Explaining focal points: cognitive hierarchy theory versus team reasoning. *Econ. J.* 120, 40–79
43. Bardsley, N. and Ule, A. (2017) Focal points revisited: team reasoning, the principle of insufficient reason and cognitive hierarchy theory. *J. Econ. Behav. Organ.* 133, 74–876
44. Butler, D.J. (2012) A choice for 'me' or for 'us'? Using we-reasoning to predict cooperation and coordination in games. *Theory Decis.* 73, 53–76

45. Colman, A.M. *et al.* (2008) Collective rationality in interactive decisions: evidence for team reasoning. *Acta Psychol. (Amst.)* 128, 387–397
46. Colman, A.M. *et al.* (2014) Explaining strategic coordination: cognitive hierarchy theory, strong Stackelberg reasoning, and team reasoning. *Decision* 1, 35–58
47. Pulford, B.D. *et al.* (2017) Reasons for cooperating in repeated interactions: social value orientations, fuzzy traces, reciprocity, and activity bias. *Decision* 4, 102–122
48. Tomasello, M. (2008) *Origins of Human Communication*, MIT Press
49. Vasil, J. *et al.* (2020) A world unto itself: human communication as active inference. *Front. Psychol.* 11, 417
50. Wilson, D.S. *et al.* (2023) Multilevel cultural evolution: from new theory to practical applications. *Proc. Natl. Acad. Sci. U. S. A.* 120, e2218222120
51. Zaki, J. (2013) Cue integration: a common framework for social cognition and physical perception. *Perspect. Psychol. Sci.* 8, 296–312
52. Loehr, J.D. (2022) The sense of agency in joint action: an integrative review. *Psychon. Bull. Rev.* 29, 1089–1117
53. Pacherie, E. (2014) How does it feel to act together? *Phenomenol. Cogn. Sci.* 13, 25–46
54. Silver, C.A. *et al.* (2021) Social agency as a continuum. *Psychon. Bull. Rev.* 28, 434–453
55. Miles, L.K. *et al.* (2010) Moving memories: behavioral synchrony and memory for self and others. *J. Exp. Soc. Psychol.* 46, 457–460
56. Koudenburg, N. *et al.* (2013) Conversational flow promotes solidarity. *PLoS One* 8, e78363
57. Marsh, K.L. *et al.* (2009) Social connection through joint action and interpersonal coordination. *Top. Cogn. Sci.* 1, 320–339
58. Lakens, D. and Stel, M. (2011) If they move in sync, they must feel in sync: movement synchrony leads to attributions of rapport and entitativity. *Soc. Cogn.* 29, 1–14
59. Rabinowitch, T.-C. and Knafo-Noam, A. (2015) Synchronous rhythmic interaction enhances children's perceived similarity and closeness towards each other. *PLoS One* 10, e0120878
60. Sogut, C. *et al.* (2015) Now or later: synchrony effects on electronic word-of-mouth content. In *Consumer Psychology in a Social Media World* (Dimoufte, C. *et al.*, eds), pp. 53–68, Routledge
61. Paladino, M.-P. *et al.* (2010) Synchronous multisensory stimulation blurs self-other boundaries. *Psychol. Sci.* 21, 1202–1207
62. Constable, M.D. *et al.* (2019) Relevant for us? We-prioritization in cognitive processing. *J. Exp. Psychol. Hum. Percept. Perform.* 45, 1549–1561
63. Boothby, E.J. *et al.* (2014) Shared experiences are amplified. *Psychol. Sci.* 25, 2209–2216
64. Boothby, E.J. *et al.* (2017) The world looks better together: how close others enhance our visual experiences. *Pers. Relatsh.* 24, 694–714
65. Boothby, E.J. *et al.* (2016) Psychological distance moderates the amplification of shared experience. *Pers. Soc. Psychol. Bull.* 42, 1431–1444
66. Sarasso, P. *et al.* (2022) Physical but not virtual presence of others potentiates implicit and explicit learning. *Sci. Rep.* 12, 1–11
67. Shteynberg, G. (2010) A silent emergence of culture: the social tuning effect. *J. Pers. Soc. Psychol.* 99, 683–689
68. Shteynberg, G. *et al.* (2014) Feeling more together: group attention intensifies emotion. *Emotion* 14, 1102–1114
69. Jolly, E. *et al.* (2019) Wanting without enjoying: the social value of sharing experiences. *PLoS One* 14, e0215318
70. Shteynberg, G. and Galinsky, A.D. (2011) Implicit coordination: sharing goals with similar others intensifies goal pursuit. *J. Exp. Soc. Psychol.* 47, 1291–1294
71. Shteynberg, G. *et al.* (2016) The broadcast of shared attention and its impact on political persuasion. *J. Pers. Soc. Psychol.* 111, 665–673
72. Shteynberg, G. and Apfelbaum, E.P. (2013) The power of shared experience: simultaneous observation with similar others facilitates social learning. *Soc. Psychol. Personal. Sci.* 4, 738–744
73. Davidesco, I. *et al.* (2019) Brain-to-brain synchrony between students and teachers predicts learning outcomes. *bioRxiv* Published online September 27, 2019. <https://doi.org/10.1101/644047>
74. Lomoriello, S.A. *et al.* (2022) Shared attention amplifies the neural processing of emotional faces. *J. Cogn. Neurosci.* 34, 917–932
75. Mairon, N. *et al.* (2020) Behavioral and EEG measures show no amplifying effects of shared attention on attention or memory. *Sci. Rep.* 10, 8458
76. Keene, J. *et al.* (2019) The effect of plot explicit, educational explicit, and implicit inference information and co-viewing on children's internal and external cognitive processing. *J. Appl. Commun. Res.* 47, 153–174
77. Rasmussen, E. *et al.* (2017) Explaining parental co-viewing: the role of social facilitation and arousal. *Commun. Monogr.* 84, 365–384
78. Wagner, U. *et al.* (2017) The joint action effect on memory as a social phenomenon: the role of cued attention and psychological distance. *Front. Psychol.* 8, 1697
79. Echterhoff, G. *et al.* (2005) Audience-tuning effects on memory: the role of shared reality. *J. Pers. Soc. Psychol.* 89, 257
80. Echterhoff, G. *et al.* (2017) Shared reality in intergroup communication: increasing the epistemic authority of an out-group audience. *J. Exp. Psychol. Gen.* 146, 806
81. Echterhoff, G. *et al.* (2013) Adjusting shared reality: communicators' memory changes as their connection with their audience changes. *Soc. Cogn.* 31, 162
82. Echterhoff, G. *et al.* (2009) Audience-tuning effects on communicators' memory: the role of audience status in sharing reality. *Soc. Psychol.* 40, 150–163
83. Rossignac-Milon, M. *et al.* (2021) Merged minds: generalized shared reality in dyadic relationships. *J. Pers. Soc. Psychol.* 120, 882
84. Wolf, W. *et al.* (2016) Joint attention, shared goals, and social bonding. *Br. J. Psychol.* 107, 322–337
85. Haj-Mohamadi, P. *et al.* (2018) When can shared attention increase affiliation? On the bonding effects of co-experienced belief affirmation. *J. Exp. Soc. Psychol.* 75, 103–106
86. Wolf, W. and Tomasello, M. (2019) Visually attending to a video together facilitates great ape social closeness. *Proc. R. Soc. B* 286, 20190488
87. Wolf, W. and Tomasello, M. (2020) Watching a video together creates social closeness between children and adults. *J. Exp. Child Psychol.* 189, 104712
88. Bräuer, J. *et al.* (2005) All Great Ape species follow gaze to distant locations and around barriers. *J. Comp. Psychol.* 119, 145–154
89. Tomasello, M. *et al.* (1999) Chimpanzees, *Pan troglodytes*, follow gaze direction geometrically. *Anim. Behav.* 58, 769–777
90. Call, J. *et al.* (2004) 'Unwilling' versus 'unable': chimpanzees' understanding of human intentional action. *Dev. Sci.* 7, 488–498
91. Krupenye, C. *et al.* (2016) Great apes anticipate that other individuals will act according to false beliefs. *Science* 354, 110–114
92. Wolf, W. and Tomasello, M. (2020) Human children, but not great apes, become socially closer by sharing an experience in common ground. *J. Exp. Child Psychol.* 199, 104930
93. Siposova, B. *et al.* (2018) Communicative eye contact signals a commitment to cooperate for young children. *Cognition* 179, 192–201
94. Wohltjen, S. and Wheatley, T. (2021) Eye contact marks the rise and fall of shared attention in conversation. *Proc. Natl. Acad. Sci. U. S. A.* 118, 2106645118
95. Woolley, K. and Fishbach, A. (2017) A recipe for friendship: similar food consumption promotes trust and cooperation. *J. Consum. Psychol.* 27, 1–10
96. Woolley, K. and Fishbach, A. (2019) Shared plates, shared minds: consuming from a shared plate promotes cooperation. *Psychol. Sci.* 30, 541–552
97. Liu, P. and Kwon, T. (2023) The psychology of shared consumption. In *The Cambridge Handbook of Consumer Psychology* ((2nd edn) (Lamberton, C. *et al.*, eds), pp. 416–444, Cambridge University Press

98. Hove, M.J. and Risen, J.L. (2009) It's all in the timing: interpersonal synchrony increases affiliation. *Soc. Cogn.* 27, 949–960
99. Wiltermuth, S.S. and Heath, C. (2009) Synchrony and cooperation. *Psychol. Sci.* 20, 1–5
100. Howard, E.M. *et al.* (2021) Social context facilitates visuomotor synchrony and bonding in children and adults. *Sci. Rep.* 11, 22869
101. Tarr, B. *et al.* (2015) Synchrony and exertion during dance independently raise pain threshold and encourage social bonding. *Biol. Lett.* 11, 20150767
102. Tarr, B. *et al.* (2016) Silent disco: dancing in synchrony leads to elevated pain thresholds and social closeness. *Evol. Hum. Behav.* 37, 343–349
103. Whitehouse, H. *et al.* (2017) The evolution of extreme cooperation via shared dysphoric experiences. *Sci. Rep.* 7, 44292
104. Dunbar, R.I.M. *et al.* (2016) Emotional arousal when watching drama increases pain threshold and social bonding. *R. Soc. Open Sci.* 3, 160288
105. Rennung, M. and Göritz, A.S. (2015) Facing sorrow as a group unites. Facing sorrow in a group divides. *PLoS One* 10, e0136750
106. Skorich, D.P. *et al.* (2017) Exploring the cognitive foundations of the shared attention mechanism: evidence for a relationship between self-categorization and shared attention across the autism spectrum. *J. Autism Dev. Disord.* 47, 1341–1353
107. Thomas, K.A. *et al.* (2014) The psychology of coordination and common knowledge. *J. Pers. Soc. Psychol.* 107, 657–676
108. Pinel, E.C. *et al.* (2015) In the blink of an I: on delayed but identical subjective reactions and their effect on self-interested behavior. *J. Soc. Psychol.* 155, 605–616
109. Gardin, H. *et al.* (1973) Proxemic effects on cooperation, attitude, and approach-avoidance in a Prisoner's Dilemma game. *J. Pers. Soc. Psychol.* 27, 13–18
110. Tajfel, H. *et al.* (1971) Social categorisation and intergroup behaviour. *Eur. J. Soc. Psychol.* 1, 169–192
111. Brewer, M.B. and Gardner, W. (1996) Who is this 'We'? Levels of collective identity and self representations. *J. Pers. Soc. Psychol.* 71, 83–93
112. Turner, J.C. *et al.* (1987) *Rediscovering the Social Group: A Self-Categorization Theory*, Basil Blackwell
113. Diehl, M. (1990) The minimal group paradigm: theoretical explanations and empirical findings. *Eur. Rev. Soc. Psychol.* 1, 263–292
114. Gutsell, J.N. and Inzlicht, M. (2012) Intergroup differences in the sharing of emotive states: neural evidence of an empathy gap. *Soc. Cogn. Affect. Neurosci.* 7, 596–603
115. Simon, J.C. and Gutsell, J.N. (2020) Effects of minimal grouping on implicit prejudice, inhumanization, and neural processing despite orthogonal social categorizations. *Group Process. Intergroup Relat. GPIR* 23, 323–343
116. Gönültaş, S. *et al.* (2020) The capricious nature of theory of mind: does mental state understanding depend on the characteristics of the target? *Child Dev.* 91, e280–e298
117. Terry, D.J. *et al.* (2001) Attitudes, behavior, and social context: the role of norms and group membership in social influence processes. In *Social Influence: Direct and Indirect Processes* (Forgas, J.P. and Williams, K.D., eds), pp. 253–270, Psychology Press
118. Reicher, S.D. *et al.* (1995) A social identity model of deindividuation phenomena. *Eur. Rev. Soc. Psychol.* 6, 161–198
119. Legare, C.H. and Nielsen, M. (2015) Imitation and innovation: the dual engines of cultural learning. *Trends Cogn. Sci.* 19, 688–699
120. Caporael, L.R. *et al.* (2014) *Developing Scaffolds in Evolution, Culture, and Cognition*, MIT Press
121. Aron, A. *et al.* (1991) Close relationships as including other in the self. *J. Pers. Soc. Psychol.* 60, 241–253
122. De Cremer, D. (2004) The closer we are, the more we are alike: the effect of self-other merging on depersonalized self-perception. *Curr. Psychol.* 22, 316–324