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Collaboration Both Hurts and Helps Memory: A Cognitive Perspective

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Abstract

Humans spend a majority of their lives in a social context. So historically, several disciplines have pursued a study of the social aspects of memory. Yet, research on memory in cognitive psychology has, for more than a century, concentrated mainly on individuals working in isolation. A recent shift in this orientation has led to a rapid growth in cognitive research revealing both counterintuitive and complex effects of collaboration on learning and remembering. For example, despite subjective reports to the contrary, collaboration impairs a group's recall performance compared to its potential. Yet, individual group members also show improvements in recall after collaboration. This article highlights the role of cognitive mechanisms in producing these and other benefits and costs of collaboration and in shaping both individual and collective memories.

Keywords

collaborative inhibition, re-exposure gains, error pruning, social contagion errors, collective memory, collaborative encoding deficit, postcollaborative memory

We live in a social context, experiencing and recalling the milestones as well as the minutiae of our lives with friends, family members, co-workers, and sometimes even strangers. Even when we experience an event alone we usually narrate it to others, thus building memories together. Such socially situated memories have generated a wide, interdisciplinary interest among philosophers, sociologists, historians, and anthropologists, who have written extensively on concepts like the group mind, the extended mind, groupthink, cultural memory, and collective memories of people and even nations (for reviews, see Hirst & Manier, 2008; Weldon, 2001). Within psychological science, social psychologists have conceptualized the idea of transactive memory, in which different group members take responsibility for remembering distinct, nonoverlapping sets of information (Wegner, 1987). Yet, researchers in mainstream cognitive psychology have historically paid relatively little attention to the social nature of memory. While the idea of social transmission of memory has been around at least since Bartlett (1932), cognitive research on memory for more than a century has largely aimed at uncovering the principles of learning and memory when individuals work alone.

A few exceptions do exist in the individual memory paradigms, as in research on eyewitness memory (e.g., Loftus, 1992), and these studies have produced powerful illustrations that human memory is highly susceptible to misinformation (i.e., incorrect information) coming from a variety of sources. Memories can also become distorted when people narrate to others individually experienced events because such retellings often involve selective and incomplete retrieval in the service of the social context and goals (Marsh, 2007). In light of such vulnerability of memory, it is striking to see that people actually choose to collaborate, and further that they even believe collaborative efforts improve memory accuracy. Indeed, surveys exploring people's beliefs about collaboration and memory reveal consistent patterns with regard to these beliefs: Both young and older adults believe that their memory performance improves when they learn and remember with others (Dixon, Gagnon, & Crow, 1998). While people generally consider working with friends and spouses to be of most help, after experiencing actual collaborative efforts in an experimental setting, people rate strangers and nonstrangers as being equally helpful (Henkel & Rajaram, in press). Does collaboration really help people to learn and remember better? More generally, how does collaboration shape memory, and why do people collaborate? Such questions are at the core of the rapidly emerging area of cognitive research on collaborative memory (Barnier &

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Sutton, 2008), and we are closer to answering them thanks to foundational advances in research on individual memory.

In a typical collaborative memory experiment, participants individually study a list of items, such as *A, B, C, D, E, F, G, H, I*, and *J*. Later, participants perform a memory task such as free recall (in which no external retrieval cue is provided to aid recall and participants are asked to reproduce all the information they studied), either working once again alone or working in groups that are typically composed of strangers (e.g., Blumen & Rajaram, 2008; Weldon & Bellinger, 1997). The groups can vary in size from two (dyads), three (triads), or occasionally to even four (tetrads), although triads are most commonly used. Collaborative group recall is calculated as the total number of studied items reported by the collaborative group working together. Predictably, the total amount recalled for a *collaborative group* is greater than that for a single individual, and this phenomenon can in part explain the belief that collaboration helps (Ross, Blatz, & Schryer, 2008). Such beliefs may also arise from the assumption that when people collaborate, they *cross-cue* each others' memories such that something that one person recalls can serve as a retrieval cue for others' unrecalled information. But such cross-cuing benefits have been difficult to detect when a more appropriate comparison is carried out, in which the recall of collaborative groups is compared to that of nominal groups to assess the effects of collaboration. A nominal group is a group in name only and is composed of an equal number of individuals (in this example, three individuals) who perform the recall task alone, and their individual recall products are pooled in a nonredundant fashion (with overlapping items across recall lists being counted only once) to arrive at nominal group recall. For example, if Participant 1 recalls items *A, B*, and *C*, Participant 2 recalls *A, D*, and *E*, and Participant 3 recalls *A, E, F*, and *G*, then the pooled, nonoverlapping nominal recall is seven items: *A, B, C, D, E, F, G*. A comparison of recall of nominal groups with collaborative groups shows a counterintuitive outcome: Collaborative groups recall significantly less than do nominal groups. For example, in one experiment we asked participants to study a list of unrelated words and then recall the list either individually (to form nominal groups of three) or in collaborating triads; across two pairs of comparison conditions, nominal groups recalled 68% to 70% of the studied items, whereas collaborative groups recalled 54% to 56% of the studied items (Blumen & Rajaram, 2008). This phenomenon of reduced collaborative recall is known as *collaborative inhibition* (Weldon & Bellinger, 1997). Thus, while an interacting group recalls more than each of its individual members, it nonetheless recalls less than its overall potential.

How Does Collaboration Hurt Memory?

Collaborative inhibition in group recall has been reported for a wide variety of study materials: words, pictures, word pairs, stories, film clips, and emotionally laden events. It occurs not only among strangers who have no established pattern of collaboration but also among friends and spouses, although it sometimes attenuates in these groups (see Ross et al., 2008). Collaborative inhibition also occurs across the life span in children, young adults, and older adults. In brief, collaborative inhibition is robust (for details see Rajaram & Pereira-Pasarin, 2010).

Why does collaborative inhibition occur in recall? Although social loafing (i.e., inadequate effort by the members because they do not feel as personally responsible in group situations) seems an obvious explanation, it cannot account for the basic phenomenon (see Weldon, 2001). This is not to say that social factors are irrelevant in collaborative situations—factors such as social conformity can also play a role (Reysen, 2005). But collaborative inhibition does not arise simply because of a lack of motivation as evidence shows that a cognitive mechanism, namely *retrieval disruption*, is critically involved (Basden, Basden, Bryner, & Thomas, 1997). In this account, collaborative inhibition is due to disruption of individual retrieval strategies during collaboration. Each group member develops an idiosyncratic organization of study information based on his or her unique past knowledge and experiences, thereby bringing a somewhat unique retrieval strategy to the collaborative situation. Retrieval disruption occurs because individuals must listen to others' output that is misaligned with their own retrieval plans; such disruption lowers each member's recall during collaboration. Support for this reasoning comes from studies such as one in which participants studied lists that consisted of an equal number of items but either contained small categories (6 instances from each of 15 categories such as fruits, vehicles, animals, etc.) or large categories (15 instances from each of 6 categories). Collaborative inhibition was reduced for the recall of small compared to large categories. This was presumably because large categories allow for recall to be organized in varied ways and the resulting misalignment in organization across group members can lead to more disruption during recall, whereas small categories can be more tightly and similarly organized and thereby create less disruption (Basden et al., 1997). As another example, collaborative inhibition is also eliminated when a memory task provides retrieval cues (e.g., cued recall) that do not require reliance on one's own organization for retrieval (e.g., Barber, Rajaram, & Aron, 2010; Finlay, Hitch, & Meudell, 2000).

What are the consequences of collaborative inhibition on postcollaborative memory? Interestingly, the ill effects of retrieval disruption that occur during group recall sometimes disappear but at other times persist in postcollaborative memories. In general, when each member performs the postcollaborative recall task alone (in the absence of others' potentially disruptive output), there is a rebound such that people recover many items that were not recalled during collaboration (Basden et al., 1997; Finlay et al., 2000). But there is also growing evidence that if a person does not recall previously known information during collaboration, this information may be absent even on a post-collaborative task that is performed alone—a phenomenon Hirst and colleagues have called socially shared retrieval-induced forgetting (Coman, Manier, & Hirst, 2009). Such a socially based process of forgetting has

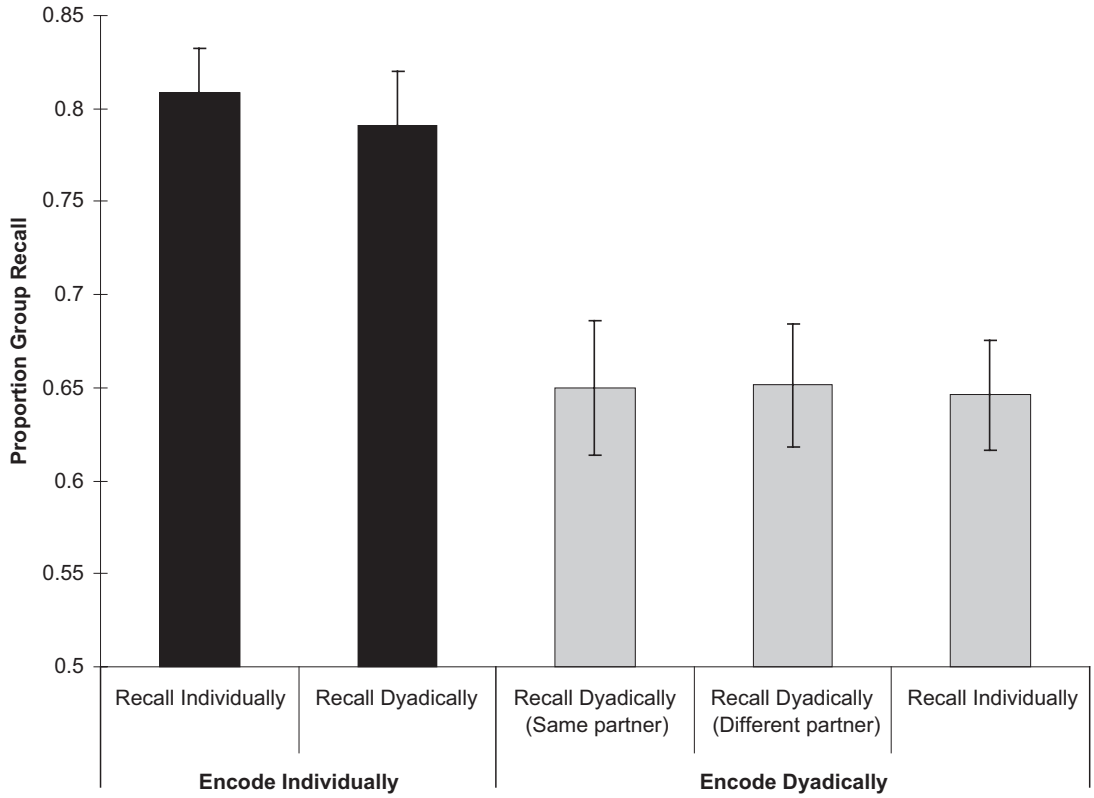

Fig. 1. Mean proportion of words recalled correctly by collaborative and nominal dyads as a function of the encoding and recall conditions (Error bars are ± one Standard Error; Barber, Rajaram, & Aron, 2010, Experiment 1). Collaborative encoding by dyads impaired later cued recall performance regardless of whether the recall task was performed individually by each member, in collaboration with a partner, or even in collaboration with the same partner as at encoding.

far-reaching implications for the effects of collaboration, because factors such as sensitivity or the taboo nature of a topic (see Coman et al., 2009), social conformity (Reysen, 2005), group composition with varying levels of status or expertise, or different group sizes during collaboration can induce people to withhold information and thereby produce both collaborative inhibition and postcollaborative forgetting. The reasons behind these opposing patterns of rebound versus forgetting in postcollaborative memory are not yet clear, but they may relate to a possible distinction between the cognitive versus social bases of collaborative inhibition.

Yet another cost of collaboration comes in a reverse form, in which people incorporate others' erroneous responses into their own memories—demonstrating *social contagion* of memory (Roediger, Meade, & Bergman, 2001). Together, collaboration impairs memory by lowering the group product through retrieval disruption during group recall and by reshaping postcollaborative memories away from the original experience through socially induced forgetting and social contagion errors.

The methodologies in the foregoing studies on collaboration costs have an interesting aspect in common in that much of this research has centered on collaborative efforts during retrieval. It is possible that if people start to collaborate from the encoding stage itself, the costs of collaboration may disappear or even reverse. Tests of this hypothesis are scant, but the initial evidence once again seems counterintuitive (Andersson & Rönnberg, 1995; Barber et al., 2010; Hollingshead, 1998). Memory benefits do emerge when the same dyads collaborate both at encoding and retrieval but these benefits seem to require the use of transactive memory for learning—that is, dividing the responsibility for who learns what. Otherwise, even dyads of individuals familiar with each other, such as dating couples, can show impaired memory as a group following collaborative encoding (e.g., Hollingshead, 1998). We found strong evidence for a collaborative encoding deficit when stranger dyads worked together at study to jointly create sentences from unrelated word pairs, such as *cloth–battle* (Barber et al., 2010); collaborative encoding impaired the cohesiveness of the created sentences—for instance "I have some *cloth* and every day is a *battle*" (low cohesiveness sentence) or "White *cloth* is used to surrender in a *battle*" (high cohesiveness sentence)—and also impaired later recall performance, when participants were presented with the first word of the pair (*cloth*) and had to recall the second word (*battle*). In fact, this collaborative encoding deficit occurred even when the same dyads performed the study and the recall tasks together (see Fig. 1). These findings suggest that jointly created cues are less effective for later recall than are self-generated cues (Mäntylä & Nilsson, 1983) and that the

learning process (transactive or coconstructive) may turn out to be critical for producing facilitative or interfering effects of collaborative encoding.

In brief, both collaborative learning and collaborative remembering usually impair memory performance. In the face of such evidence, it seems mystifying that people readily believe collaboration helps memory. Balanced against these costs must therefore exist various benefits of collaboration.

How Does Collaboration Help Memory?

When people recall studied information together, group members are re-exposed to information others recall during collaboration that they had themselves forgotten. Such re-exposure or a second study opportunity enhances postcollaborative memory (Blumen & Rajaram, 2008; Weldon & Bellinger, 1997), and the type of collaboration opportunities (such as different combinations of individual and collaborative recall sessions) that precede individual recall can determine the magnitude of such downstream benefits (Blumen & Rajaram, 2008). These postcollaborative improvements thus reflect net gains in memory because the benefits of re-exposure must outweigh the costs of socially induced forgetting described earlier.

Collaboration can also aid memory through error pruning. During collaboration, people can curtail their own recall errors with the help of feedback from other group members (Ross et al., 2008). This process can be thought of as the opposite of the social contagion errors described earlier. Error pruning does not occur when people take turns to contribute information because under such minimally collaborative conditions group members cannot dispute each other's responses (Basden et al., 1997; Meade & Roediger, 2009). Rather, error pruning is aided by free-flowing collaboration in which group members engage in discussion and devise their own ways to resolve disagreements (e.g., Barber et al., 2010; Ross et al., 2008). The experiences of re-exposure and error corrections during collaboration may be yet other reasons why people believe collaboration helps memory.

Emergence of Shared and Collective Memories Through Collaboration

A cognitive analysis of the collaborative process not only illuminates how social influences shape individual learning and memory but can also serve as a powerful tool for understanding how individually held memories and individual memory mechanisms shape socially shared memories. Shared memories are defined as those that overlap among the members of a group, and when such memories also bear upon the identity of the group, they are known as collective memories (see Hirst & Manier, 2008, for definitions, review, and insightful conceptual analyses and proposals). We have argued that the cognitive processes specified in the preceding sections can jointly reconstruct and reshape the past through their independent and interactive operations (Rajaram & Pereira-Pasarin, 2010): People may relearn, strengthen, and augment their own memories by re-exposure to accurate past information narrated by others, forget some of their own memories through socially induced forgetting (see Coman et al., 2009), incorporate into their memories others' erroneous interjections through social contagion errors, or reduce their own incorrect retrievals through collaborative error pruning. In this process, as Hirst and colleagues (Coman et al., 2009; Hirst & Manier, 2008) and Ross et al. (2008) have discussed, goals, motivations, and interpersonal arrangements (e.g., differential status or expertise of group members) for learning and remembering may interact with the constraints of the mnemonic processes to select information that is rehearsed, ignored, rejected, or forgotten, and iterative cycles of these interactions can thus shape social transmission and the emergence of jointly held memories. The fulfilling of common social goals that such congruence and alignment in memory make possible might further explain why people believe collaboration benefits memory.

Future Directions

The historical context of interdisciplinary interests in social memory and the recent emergence of laboratory tools to test and measure this phenomenon create an unprecedented opportunity to ask exciting questions about the impact of collaboration on memory. As with any new area of scientific inquiry, the initial questions in this new arena have focused on identifying the fundamental variables and outcomes involved in collaborative memory (Rajaram & Pereira-Pasarin, 2010). These foundational investigations now prime the next levels of analysis in various domains. For instance, we now know that collaboration simultaneously imposes costs—by disrupting memories, causing forgetting and increasing social contagion errors—and creates benefits—through re-exposure effects and error pruning. These findings compel us to ask fundamental questions about how we might optimize the widely practiced and highly popular educational practice of group study methods so as to maximize the benefits of collaboration while minimizing the cognitive costs.

Another area of study concerns the impact of collaboration on recall of semantic knowledge (as opposed to episodic recall, tested in prior studies). Preliminary evidence suggests that not only might collaborative inhibition disappear, it might even reverse when collaborating members retrieve prior semantic knowledge, because its rich interconnections can enable cross-cuing (see Weldon, 2001).

In the domain of interpersonal relationships, the initial evidence shows that collaborative inhibition may occur among familiar partners such as friends and spouses, as well as among older adults (Henkel & Rajaram, in press; Meade & Roediger, 2009; Ross et al. 2008). But potentially important mitigating factors and postcollaborative benefits deserve further scrutiny. Collaboration is also assumed to play a critical role in shaping interactions and memory in much larger and complex groups such as workplaces and communities, and this phenomenon bears closer examination within the cognitive experimental framework (Weldon, 2001).

Collaborative memory mechanisms also have important implications for the treatment of trauma in clinical settings, and depending on how collaboration is used in these settings the outcomes could be harmful or helpful. For example, on the one hand, researchers have discussed the potential dangers of the memory recovery techniques used in therapy in implanting suggestions in clients and thereby creating traumatic childhood memories for events that did not happen (e.g., see Lindsay & Read, 1994). On the other hand, Wessel and Moulds (2008) have recently outlined two means by which shared remembering could help people recover from posttraumatic stress disorder: One, shared remembering can promote emotion regulation; and two, changes in memory can occur because others' input can downplay emotionally disturbing details or provide alternative details that alter or blunt the traumatic aspects of one's memories.

The emerging research domains outlined here by no means constitute an exhaustive list of issues that cognitive analyses can illuminate. But they highlight the enormous potential in front of us for understanding the widely pervasive and fundamentally important phenomenon of social memory. At the core remain questions not only about how collaboration shapes memory, but also about the functional goals that make people choose to collaborate, what goals drive the need to arrive at shared representations of the past, and how the cognitive constraints may be optimally used to improve memory functions related to educational, social, and health-related goals.

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Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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