Are two heads better than one?

...Or do too many cooks spoil the broth? **REBECCA THOMPSON** *investigates collaborative memory.*

THE common adages 'Two heads are better than one', 'Many hands make light work' and 'Too many cooks spoil the broth' highlight interesting patterns of human behaviour. They suggest that the presence of others sometimes facilitates performance, sometimes hinders it. The field of social psychology has long been interested in the effects that the presence of others has on the performance of an individual: classic studies on conformity (Asch, 1956) and obedience (Milgram, 1963) demonstrate the detrimental effects that can occur in social situations.

However, it is only fairly recently that cognitive psychologists have begun to embrace the idea that the presence of others may have a significant impact on an individual's *cognitive* processes. Traditional cognitive research, in particular memory research, has focused on testing individual participants. This approach supports the view that cognitive processes occur in the individual mind. Research using this 'individual methodology' has provided cognitive psychology with invaluable models of the processes involved in human memory and learning. But the predominant use of lone participants in memory research ignores the potential influence of social interactions on performance. This is the topic of collaborative-memory research.

Pooling vs. collaboration

If we think about everyday situations that involve memory, many of the situations that come to mind will include an interpersonal component. After all, humans are very social creatures, and a large proportion of our cognitive activity occurs in a social setting. Shared memories form the basis of interpersonal relationships and help to promote group cohesion by the building of a shared history.

If asked to predict the performance of a collaborating group compared with that of an individual, your prediction would probably coincide with the intuitive belief that two heads are better than one – that group performance will be superior to individual performance. And indeed, taken in absolute terms, the literature does conclude that group performance is larger than individual performance. But this result should not be taken at face value, as 'pooling' individual performances into a group performance has the potential to outperform the individual, without necessarily invoking collaborative processes.

Collaborative-memory research therefore makes a clear distinction between group effects (better performance due to pooling of abilities) and genuine collaborative effects. This distinction is achieved by comparing the performance of 'collaborating or interacting groups' with the performance of nominal, non-interacting groups. Nominal groups are groups only in name, and consist of two or more individuals who work alone at all times through an experiment. At analysis their data are combined as if they had worked together collaboratively. Three predictions can be made:

- If collaboration has no effect on performance, collaborative performance will equal nominal performance.
- If collaboration benefits performance, then collaborating performance will be greater than nominal performance.
- If collaboration negatively effects performance, collaborative performance will be less than the nominal group performance.

From social to cognitive

Ringleman, a psychologist working in Germany in the early part of the 20th century, performed a study that investigated 'social effects' on a physical rope-pulling task (unpublished work, cited in Moede, 1927). He observed that an individual participant pulled the rope at a pressure of 63kg. Surprisingly, groups of three participants pulled the rope at 160kg (only 2.5 times greater than an individual) and groups of eight pulled the rope at a pressure of 248kg, less than four times the individual pulling rate. The early work of Ringleman provided an intriguing contradiction to the intuitive social perception that group work is highly productive. Latane (1979) replicated this negative effect of group work using different physical tasks, including hand clapping and shouting.

These counterintuitive results raise the interesting question of whether working with others produces negative effects on cognitive tasks. This is an important question – the outcomes of everyday 'memory collaboration' situations have a direct impact on society. Everyday situations that produce a collaborative output include educational settings where small groups of students complete tasks, eyewitness testimonies, jury verdicts, and decision-making tasks in business meetings.

The first insights into the notion that cognitive tasks may be negatively affected by collaboration were provided by Taylor *et al*. (1958) and Dunnette *et al*. (1963). These studies compared the performance of brainstorming groups with brainstorming individuals (nominal groups). Remarkably, both studies reported that the brainstorming groups produced fewer novel ideas compared with the pooled performance of similar numbers of individual participants working alone on the task. Bouchard and Hare (1970) replicated these findings using a wide range of group sizes and concluded 'group brainstorming inhibits rather than facilitates creative thinking, and pooled effort is far more productive than group effort' (p.51).

In line with the surprising findings of Ringleman and others, collaborative-memory research has revealed that participants who collaborate on memory tasks are often negatively affected by collaboration (see Weldon, 2000, for a recent review of this work). Research has shown that collaborating group performance on a number of different tasks, including story recall (Andersson & Ronnberg, 1996) and word-list retrieval (Basden *et al.*, 1997), is lower than the level predicted from the performance of nominal groups. Meudell *et al.* (1995) reported that collaborating groups of participants were unable to provide retrieval cues for their collaborator that were capable of stimulating the production of new memories, also known as cross-cueing.

This failure to exceed the predicted performance from a simple pooling of abilities is termed 'collaborative inhibition' (Weldon & Bellinger, 1997). Explanations fall within two schools of thought: social and cognitive. The social perspective suggests that members of collaborating groups experience low levels of motivation to work with other members of the group. Poor coordination and communication of the task objectives may occur between group members. Diehl and Stroebe (1991) suggest that members of collaborating groups may feel apprehensive or even embarrassed about contributing in a group situation, preventing the members of the group contributing at their full potential. Latane *et al.* (1979) proposed that individuals working in a group situation perform at a reduced level of performance ('social loaf'). Individuals in a group situation tend to perceive that they have less personal responsibility for the group output, than they do for an individual performance, so this diffusion of responsibility results in lower output.

Providing a bridge between social and cognitive explanations, Zajonc's theory of social facilitation (Zajonc, 1968) states that the presence of other people creates a state of arousal in an individual. This arousal has two different effects on performance: on easy or well-learned tasks performance is facilitated, but on difficult or novel tasks performance is inhibited. It we apply Zajonc's theory to novel or difficult memory tasks, this may explain why tasks are affected negatively by the presence of others.

Indeed, recent research has provided evidence that collaborative inhibition is more likely to be caused by disruption in cognitive processes, rather than by motivational or social factors. Cognitive disruption explanations are based on the idea that each individual is equipped with a unique set of strategies to retrieve information from their memory store. An individual's own memory strategies are the most effective at cueing retrieval from their memory. These strategies are extremely vulnerable to disruption, including by the presence of other people's retrieval cues. Weldon *et al.* (2000) experimentally increased levels of motivation in collaborating participants by offering large cash rewards for working to a set level. But despite the increased levels of motivation, elevated levels of collaborative performance were not found. Finlay *et al.* (2000) reported that collaborating participants who had learnt the test

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information together experienced less collaborative inhibition than participants who had learnt the information individually. This may be due to the fact that the participants who learnt the materials together were able to create similar representations of the materials and were subsequently able to provide effective retrieval cues for their collaborator.

Reduced recall is not the only negative effect of memory collaboration: memory accuracy has also been shown to be negatively effected by the presence of others. Determining the extent to which an individual's memory can be manipulated and changed by the influence of others is very important; for example, the legal system places a great deal of emphasis on eyewitness reports of crimes.

Loftus (1979) introduced the 'post-event misinformation paradigm', which suggests that false or misleading information presented after an individual has 'witnessed' an event can be incorporated into a person's memory of the event. This may be more likely in group situations. Using a simulation of a police interrogation, Clark and Stephenson (1990) reported that groups of participants were more likely than individuals to be overconfident in the accuracy of responses that were actually incorrect. Wells and Bradfield (1999) demonstrated that participants who were given false feedback about the accuracy of their performance during a mock identification parade, had inflated ratings of how confident they had been as they made their identifications, even though they had chosen the wrong suspect.

Wright *et al.* (2000) cite the Oklahoma bombing case as a real-life example of the contamination of eyewitness information through collaborative memory. Here, eyewitnesses were able to discuss details of their individual experiences of the atrocity with other eyewitnesses. Subsequently a large number of the eyewitnesses claimed that they had seen an accomplice with Timothy McVeigh, the man who was later convicted and executed for the bombing. However, no other evidence of an accomplice was uncovered and his existence remains an area of controversy. Did the witnesses plant false information in each other's minds through collaborative recall?

So do too many cooks always spoil the broth?

Recent collaborative-memory research has begun to look at situational and individual variables that influence the *level* of disruption that occurs during collaboration.

Friend or stranger? The first area of investigation is the idea that collaborating groups of friends suffer less from collaboration inhibition than do collaborating groups of strangers (Andersson & Ronnberg, 1995). Wegner *et al.* (1991) claim that groups of friends possess knowledge of how their friends' or partner's memory works (e.g. what they know and how it is represented). Referred to as 'transactive memory', this may enable them to produce retrieval cues that are direct enough to cue memory production.

On a similar note, Smith and Ellsworth (1987) suggest that an individual is less likely to accept erroneous information into their memory of an event if the source of the information is believed to be untrustworthy. Hoffman *et al.* (2001) showed that undermining the credibility of the source of the misleading information, (e.g. claiming that a response had been randomly generated by an unreliable computer) lowered the acceptance of the

misleading false information into memory. This is in contrast to when the source of the information was claimed to be from a highly credible source.

Type of task Another suggestion is that collaboration is only beneficial on certain memory tasks. A common memory task used in collaborative-memory research is word-list retrieval. Word-list retrieval tasks require free recall of a list of previously learnt words. The list of words used varies in length and can contain either associated words (*cat, horse, cow*) or unassociated words (*house, tree, shoe*). Free-recall tasks rely heavily on an individual's unique retrieval strategies for the retrieval of the materials from memory. When an individual is asked to collaborate on a free-recall task they are exposed to their collaborator's retrieval strategies, which may be different from their own. This results in disruption, which in turn results in a limited output.

When memory tasks are used that do not rely on individual retrieval cues, collaborative-memory performance is less affected by collaborative inhibition. Cued-recall tasks eliminate the reliance on individual retrieval strategies by providing a memory cue for the 'to-be-remembered' item at retrieval (e.g. *horse* as a cue to *cow*).

I think that success or failure on collaborative memory tasks may be linked to the type of materials to be recalled. The types of materials people collaborate on in real life are often drawn from a shared knowledge bank (e.g. general knowledge, or shared personal experiences). These materials are strongly represented within the memory system, and as a result suffer less from collaboration inhibition. Word-list retrieval tasks involve the learning of new materials during an experiment. Compared with existing knowledge, new information is weakly represented in the memory. I propose that it is harder to generate retrieval cues for weakly represented knowledge, either for oneself or for others, than it is for knowledge that forms rich representations in the memory system.

Roediger (2001) showed that more false information presented by a confederate was included in memory recall when the memory trace was weak, compared with more strongly represented materials. The strength of the information was determined by the length of study duration. In the weakly represented condition the material was presented for 15 seconds; in the strongly represented condition it was presented for 60 seconds. Roediger's findings have clear implications for eyewitness statements: if eyewitnesses are unsure or unconfident of what they witnessed, they are more likely to accept misleading information from another person.

Individual differences Finally, it is suggested that different individuals are affected differentially by memory collaboration. The studies discussed above have used healthy young participants (usually undergraduate students). The patterns of collaborative inhibition and lowered memory accuracy observed on the memory tasks may be caused as a direct result of the restrictive use of young participants. Dixon (1996) introduced the idea that memory collaboration may act as a compensatory mechanism for age-related declines in memory performance.

A common negative stereotype of an older adult is that there is a general decline in cognitive processes, including memory. But it is also thought that older adults have a wealth of wisdom and knowledge to draw on, knowledge acquired through life experience. Complementing these positive social stereotypes, Holland and Rabbitt (1992) suggest that memory functioning in older adults can be improved by manipulating environmental factors.

Bringing together the above points, Thompson and Conway (2002) found that older adults' memory performance can benefit from collaboration, both on memory tasks using prior knowledge and on tasks involving new learning. In a semantic task (drawing on prior knowledge) participants were required to name a series of famous faces. In a first session of the experiment participants named the faces on their own, and in a second session they worked in collaborating groups or again alone (nominal group). The number of new items generated in Session 2 by the groups was compared (new items being names of celebrities produced in Session 2 that were not produced in Session 1). The results revealed that the collaborating groups produced significantly higher levels of new information than the nominal groups, suggesting that collaboration promoted access to previously unavailable materials. In the episodic task (involving new learning) participants were required to learn a series of made-up novel facts about well-known people (e.g. Ronald Reagan – favourite holiday destination Sydney). This time the collaborating older adults forgot fewer facts from Session 1 to session 2 than the nominal group, suggesting that the collaborative process helped to maintain the new knowledge. The improvements in performance observed in the older adults were in contrast to the performance of younger adults on the same tasks, where the performance of the collaborating group did not exceed the predicted performance of the nominal group.

So collaborative-memory research involving older adults suggests that collaboration has the potential to provide an accessible, practical everyday technique for overcoming memory problems associated with ageing. Explanations of the facilitation observed in older adults on memory tasks are based on the notion that the presence of a collaborator can offer additional external memory support, in terms of motivation to complete otherwise difficult tasks and by providing additional cues for memory retrieval. The results of the memory collaboration work involving healthy older adults provides a potential therapeutic strategy for patients with memory disorders (Fox, 1997).

A rich broth

To conclude, collaborative-memory research has highlighted patterns of performance and behaviour that cannot be observed when lone individuals are studied. The research suggests that collaboration on memory tasks is not uniformly beneficial or effective. In absolute terms, two heads are better than one when overall performance levels are compared. But when collaborating group performance is compared with predicted group performance, a very different picture emerges. With the right cooks and the right combination of ingredients, the broth has the potential to be very good indeed!

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