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We Remember, We Forget: Collaborative Remembering in Older Couples

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We Remember, We Forget: Collaborative Remembering in Older Couples

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Transactive memory theory describes the processes by which benefits for memory can occur when remembering is shared in dyads or groups. In contrast, cognitive psychology experiments demonstrate that social influences on memory disrupt and inhibit individual recall. However, most research in cognitive psychology has focused on groups of strangers recalling relatively meaningless stimuli. This study examined social influences on memory in groups with a shared history, who were recalling a range of stimuli, from word lists to personal, shared memories. The study focused, in detail, on the products and processes of remembering during in-depth interviews with 12 older married couples. These interviews consisted of three recall tasks: (a) word list recall; (b) personal list recall, where stimuli were relevant to the couples' shared past; and (c) an open-ended autobiographical interview. These tasks individually conducted and then collaboratively conducted two weeks later. Across each of the tasks, although some couples demonstrated collaborative inhibition, others demonstrated collaborative facilitation. A number of factors were identified that predicted collaborative success—in particular, group-level strategy use. The results show that collaboration may help or hinder memory, and certain interactions are more likely to produce collaborative benefits.

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Remembering often occurs jointly in social groups (Barnier, Sutton, Harris, & Wilson, 2008). People in close relationships are likely to be behaviorally, emotionally, and cognitively "interdependent" (Wegner, Giuliano, & Hertel, 1985, p. 253)—that is, in collectives such as couples, families, friends, and work teams, remembering is an interactive activity where memories are dynamically and jointly constructed in conversation (Barnier et al., 2008; Bavelas, Coates, & Johnson, 2000; Campbell, 2003; Middleton & Brown, 2005; Tollefsen, 2006). These conversations are one way that groups develop shared memories of the past (Harris, Barnier, Sutton, & Keil, 2010; Harris, Paterson, & Kemp, 2008; Hirst & Echterhoff, 2008; Hirst, Manier, & Apetroaia, 1997).

TRANSACTIVE MEMORY SYSTEMS

Wegner (1987) suggested that stable groups develop "transactive memory systems" for sharing the encoding, storage and retrieval of information between group members. According to Wegner, transactive memory systems are a "set of individual memory systems in combination with the communication that takes place between individuals" (p. 186). Although information is stored in each individual's memory, the communication between individuals means that the products and processes of the transactive system as a whole are not the simple aggregation of individual recall.

In transactive memory systems, storage is distributed between group members in an efficient way that relates to their relative expertise and role in the group (Wegner, 1987). Wegner et al. (1985) distinguished between category or topic level information (such as "a conversation with Mike at the party") and more specific item level information (such as the details of the conversation). Whereas Wegner et al. (1985) suggested that higher-order information must be shared in an efficient transactive system, there are two possibilities for lower-order information. First, lower order information can be *differentiated*—held by one group member only (Wegner et al., 1985). In the case of extreme differentiation, one group member is an expert for a particular topic and holds all relevant lower order information. In this case, the memory of the group for that topic will be same as the memory of that individual (Wegner et al., 1985). More commonly, each group member will hold different pieces of lower order information relevant to a particular topic, and in an efficient transactive system can access and combine this information to create a more complete group memory than any individual could access alone (Wegner et al., 1985)—that is, because they store different information, members of a group with an efficient transactive memory system might "cross-cue" each other to produce memories that no individual could recall alone.

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Alternatively, lower order information can be *integrated*—held in common by all group members (Wegner et al., 1985). Wegner et al. (1985) argued that integration might derive from initially differentiated memories. When group members tell each other their different, specific knowledge, this knowledge becomes shared by all group members. Wegner et al. (1985) suggested that this process of integration was likely to transform individual memories so that the new, shared, integrated memory was more than simply their aggregation. This integrative process is conceptually similar to the integration that individuals engage in when they encounter new information, incorporating it into their existing knowledge (see Smith, Adams, & Schorr, 1978). In a transactive system, this process occurs in an interaction that may produce a distinct "group" memory (Wegner et al., 1985). To illustrate the process of integration, Wegner et al. (1985) described the hypothetical example of a couple discussing a shared party experience. The man remembers that a male friend of theirs ("Tex") was depressed and hardly talked, whereas the woman remembers that Tex had seemed over friendly. This prompts the man to remember a previous occasion where Tex mentioned he was thinking of splitting from his wife. Together, the couple concludes that Tex was flirting with the woman and was embarrassed about it when he encountered the man, and their memory of the event becomes qualitatively and qualitatively different from what each remembered alone. Wegner (1987) suggested that efficient transactive memory systems must strike a balance between differentiation and integration—and because of these processes of cross-cuing and the integration of differentiated memories, transactive memory theory predicts that group memory has "emergent" properties (see Barnier et al., 2008; Theiner, 2010; Theiner & O'Connor, 2010).

There has been some empirical support for the development of transactive memory systems in intimate couples and the benefits for memory that such a system might produce. For instance, Wegner, Erber, and Raymond (1991) asked intimate couples and pairs of strangers to jointly recall words from a categorized list. Couples performed better than pairs of strangers, but only when they could use their own system of organizing responsibility for recall (their shared perception of relative distribution of expertise). When the experimenter randomly assigned responsibility for different categories to participants, strangers recalled more than couples. Wegner et al. (1991) suggested that couples had developed an implicit transactive system that was disrupted by experimenter-assigned responsibility. Despite this empirical support for transactive systems emerging in social groups (like couples) performing episodic recall tasks, most research on transactive memory has focused on more procedural task performance in organizational groups or teams (such as assembling a radio; see Liang, Moreland, & Argote, 1995). Also, although transactive memory experiments have suggested that couples can share remembering more efficiently than strangers, they do

not indicate whether couples can remember more effectively together than they would have alone.

COLLABORATIVE INHIBITION AND FACILITATION

Perhaps surprisingly, despite the benefits of shared remembering predicted by transactive memory theory and research in other domains (see Barnier et al., 2008), cognitive research has predominantly demonstrated that shared remembering has costs for recall. In the collaborative recall paradigm, the recall output of groups remembering together ("collaborative groups") is compared with the pooled non-redundant recall output of the same number of people remembering alone ("nominal groups"). Assessing group influence in this way reliably shows that collaborative groups recall less than nominal groups: this effect is termed *collaborative inhibition* (Basden, Basden, Bryner, & Thomas, 1997; Basden, Basden, & Henry, 2000; Weldon & Bellinger, 1997). Prior research (Harris, Barnier, & Sutton, 2009; Meudell, Hitch, & Boyle, 1995) has suggested that, in the laboratory, members of collaborative groups do not cross-cue each other to produce new memories in the way suggested by Wegner et al. (1985). Moreover, research has not supported the idea that acquainted groups like friends or couples collaborate more successfully on these tasks than strangers (Gould, Osborn, Krein, & Mortenson, 2002; Harris et al., 2009; but, see Andersson & Rönnberg 1995).

Although collaborative inhibition is a robust effect that has been replicated across studies, recent research provides some evidence that collaboration in certain kinds of groups and on certain kinds of tasks might help rather than hinder memory. Meade, Nokes, and Morrow (2009) found that expert pilots, who were collaborating to recall a passage about aviation, demonstrated collaborative facilitation rather than collaborative inhibition. This study is important because it is the only experimental evidence that collaborative groups can recall *more* than nominal groups, consistent with the kind of benefits predicted by transactive memory. In Meade et al.'s study, the pilots were experts about the stimuli (shared domain knowledge) and also experts at communicating with each other because they had received specific training in communication skills. It is interesting to note that, although the mechanisms involved in generating benefits through transactive memory have not been specified in detail, these two factors—shared knowledge and communication—are the components of the transactive memory system described by Wegner (1987), and these components have emerged as distinct factors in the organizational literature on transactive memory and task performance (Cooke, Gorman, Duran, & Taylor, 2007). Based on Meade et al.'s findings, shared knowledge and communication in combination seem to result in collaborative benefits.

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Shared Knowledge

Prior research has supported the idea that shared knowledge might lead to more successful collaboration. Harris et al. (2009) reported that when groups engaged in shared encoding, collaborative inhibition was abolished (see also Finlay, Hitch, & Meudell, 2000; but, see Andersson & Rönnberg, 1995; Barber, Rajaram, & Aron, 2010). Harris et al.'s (2009) findings supported Johansson, Andersson, and Rönnberg's (2005) argument that a group with shared cues might be better able to cue each others' recall when collaborating. These findings regarding shared encoding are consistent also with Wegner et al.'s (1985) suggestion that emergence is only possible when each member of the group has some information about the topic. In the organizational domain, Liang et al. (1995) also found that shared training improved group task performance.

Effective Communication

Prior research has also supported the idea that communication techniques and particular ways of interacting lead to more successful collaboration. For instance, Meade et al. (2009) identified that expert pilots used more elaborations, corrections, explanations, repetitions and restatements than novices during collaborative recall. Similarly, Gagnon and Dixon (2008) found that spouses used more elaborations than strangers when recalling together, suggesting that, like pilots, intimate couples may also be expert communicators. In terms of the relation between communication and recall, Gould, Trevithick, and Dixon (1991) demonstrated that collaborative recall performance was higher in groups who produced more elaborations during recall, both elaborations directly related to the story being recalled and elaborations linking the story to more general world knowledge. Thus, certain kinds of communication may contribute to collaborative success.

Group-Retrieval Strategies

One important aspect of effective collaborative recall might be the development of shared retrieval strategies that coordinate individual recall. Basden et al. (1997) argued that collaborative inhibition is caused by conflict between the incompatible, idiosyncratic retrieval strategies of individual group members. Research has demonstrated that keeping individual strategies more separate during collaboration abolishes collaborative inhibition (Basden et al., 1997; Finlay et al., 2000; Wright & Klumpp, 2004). However, little research in the collaborative recall paradigm has focused on encouraging groups to develop a shared, coordinated recall strategy of the kind suggested by transactive memory theory (Wegner et al., 1991), and prior research has yielded inconsistent

findings. Gould, Kurzman, and Dixon (1994) demonstrated that older couples (compared to young couples) specifically discussed remembering strategies during a collaborative recall task, and that these strategies aided their recall performance. In contrast, Hollingshead (1998a) found that couples performed better than strangers on a categorized recall task, but only when they were not allowed to talk during encoding. When couples could talk during encoding, they performed worse than strangers. Hollingshead (1998a) suggested that instructing couples to explicitly discuss their system actually impaired the efficient use of their implicit, transactive system (although they did not test the use of strategies at recall rather than at encoding). Thus, the role of group level strategies in enhancing collaborative recall and the nature of such beneficial strategies requires clarification. More generally, a focus on the process of collaboration, as well as simply scoring the output of collaborative groups is essential to understanding group remembering (see also Johansson et al., 2005).

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THE CURRENT STUDY

In this study, we aimed to focus, in detail, on collaborative remembering in certain kinds of groups, which we might expect to show benefits of shared remembering. Transactive memory theory predicts that benefits of shared remembering develop over time—the longer a group has shared the encoding and retrieval of information, the more efficient their shared remembering (Wegner, 1987; see also Tollefsen, 2006). For this reason, in this study we focused on older couples who had been married for decades. We considered that if cognitive interdependence results in collaborative facilitation, we would be most likely to see these effects in people who have shared a lifetime together.

Another reason to focus on older adults is that it has been suggested that collaborative remembering might especially benefit the memory performance of older adults, assisting them to compensate for cognitive decline (Dixon, 1996). Previous findings on collaborative recall in older adults have been mixed: older adults demonstrate collaborative inhibition (Ross, Spencer, Linardatos, Lam, & Perunovic, 2004), equivalent to that showed by younger adults (Meade & Roediger, 2009) and even when collaborating with their spouse rather than a stranger (Ross, Spencer, Blatz, & Restorick, 2008; Ross et al., 2004). However, it is interesting to note that Johansson et al. (2005) found that, although older couples, on average, showed collaborative inhibition, those couples who scored the highest on division of responsibility (as described in transactive memory theory) did not show inhibition—they recalled the same amount as nominal groups. So, although older couples, in general, might show collaborative inhibition, individual and group factors might be important in understanding when

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couples might show benefits of shared remembering like those described by transactive memory theory.

To summarize, prior research on shared remembering has emphasized its negative effects. Although transactive memory predicts benefits for long-term, intimate groups, research on whether the effects of collaboration are different for intimate groups (like couples) versus strangers, and for older versus younger adults has yielded mixed results. However, perhaps the effects are complex, and we should not expect an "either–or" finding (cf. Johansson et al., 2005). Not all couples might develop or maintain efficient transactive memory systems, they may not utilize their transactive system efficiently on all occasions, and shared remembering is only likely to have benefits for material that is relevant to the couple and their transactive memory system. If shared knowledge and effective communication are essential for collaborative benefits, we would not expect to see these in all couples or for all kinds of memories. In this research, we aimed to bring some clarity to these prior mixed findings and to do justice to the complexity of the question by adopting a case-study approach; we studied, in detail, the way that long-term couples share remembering, and whether individual variations in their relationship and their interaction might produce different patterns of collaborative inhibition or facilitation across a range of memory tasks.

Specifically, we adopted the procedure of the collaborative recall paradigm (comparing collaborative and nominal groups), but we extended prior experimental work in three crucial ways: (a) We focused on long-term married couples; (b) we conducted detailed qualitative analysis on the way each couple remembered individually and collaboratively; and (c) we focused on a range of materials, from simple word lists to richer, autobiographical material. Based on prior research, we were also interested in following up the role of shared knowledge, effective communication, and group strategies in determining the outcomes of collaboration. To that end, we focused on both the product and the processes of collaborative recall.

We conducted in-depth interviews with 12 older couples, collecting both quantitative and qualitative data. We conducted two list-based remembering tasks: 1) a words list recall task; and 2) a personal list recall task in which the stimuli were relevant to the couple and to their shared experiences. We also asked couples to describe their lives together, their autobiographies and their remembering practices, and to recall a number of autobiographical events in detail. We conducted these tasks in an individual session and again in a collaborative session two weeks later. We compared couples' nominal group (pooled individual) performance with their collaborative performance across these different tasks, to examine the effects of collaboration on word list recall, personal list recall, and on the qualitative autobiographical interview. We also aimed to examine individual differences and to look, in detail, at the process of

each couple's collaboration to determine whether we could identify particular aspects of the interaction that might result in different outcomes for memory.

METHOD

Participants

Participants were 24 (12 women and 12 men) older adults, ranging in age from 60 to 89 years ($M = 67.21$, $SD = 7.45$). These 24 individuals made up 12 heterosexual, long-term couples, married for between 26 and 60 years ($M = 40.67$, $SD = 8.39$). We recruited participants from local branches of the Rotary and Probus organization in Sydney, Australia. Our sample was deliberately homogeneous. Because of the nature of this organization, all the men and most of the women had worked in a professional capacity before retirement, and these couples came from a relatively affluent area of Sydney. All participants were Caucasian and all spoke fluent English. Only one participant did not speak English as a first language, but she had lived in Australia since she was a teenager. Participants were paid AU $50 each ($100 per couple).

Materials

We administered Lists 1 and 4 from the Hopkins Verbal Learning Test–Revised (HVLT–R; Benedict, Schretlen, Groninger, & Brandt, 1998) to participants. The HVLT–R is a short, normed test developed for diagnosing neurological impairment. There are six equivalent forms of the HVLT–R: Each list is made up of 12 words, with 4 words from each of three categories. We used this test because it is a short, relatively easy memory task and because its equivalent forms allowed us to administer different lists during Session 1 and Session 2.

We also developed a series of open-ended questions that we used as a guide for the semi-structured autobiographical interview. The topics addressed in these questions were as follows: (a) first meeting and first date, (b) wedding day and honeymoon, (c) significant personal achievements, (d) relationship-defining events, and (e) events often discussed. These questions were designed to tap a range of individual and shared, recent and distant events. We retained the order of these questions across couples, but because not all of our pre-determined events were as relevant or significant for each couple we also followed up what emerged during the course of the interview.

Procedure

This study consisted of two sessions, conducted two weeks apart. Each session included four main phases in the following order: (a) an autobiographical inter-

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view; (b) a word list recall task; (c) a personal list recall task; and (d) a discussion of everyday remembering, including the kinds of events reminisced about and the use of photos and diaries (see the later discussion on this). We conducted both sessions in the couple's home, and all sessions were audio recorded using a Sony® digital voice recorder.

Session 1

In Session 1, we conducted simultaneous individual interviews separately with each member of the couple. Interviews were conducted by Celia B. Harris and Paul G. Keil, and interviewers and participants were gender-matched such that Celia B. Harris interviewed the women and Paul G. Keil interviewed the men. We began each interview by asking participants for background information about themselves (age, city of birth, and when they met and married their spouse) before asking them to recall, in detail, specific events, including those events listed earlier (e.g., first date, wedding, and significant events), as well as anything that came up during the course of the interview. If participants only responded briefly to a question or did not provide specific information, we prompted them for more details. We tried to elicit as much detailed episodic information as possible about the discussed events. This phase normally lasted for about 30 to 40 min.

Next, we conducted the word list recall task for which we used the HVLT–R lists as stimuli. One half of the couples received List 1 in Session 1, and one half received List 4. We read aloud the list of 12 words, and asked participants to recall the list straight back to us. We wrote down the words recalled (Recall 1). This process of reading the list followed by an immediate recall test was repeated twice more (Recalls 2 and 3). Then, after a 20-min delay, we asked participants to recall all the words they had been read earlier, this time without reading the words out first (Recall 4). We then conducted a recognition test, where we read out 24 words, one half of which were "old" and one half of which were "new," and asked participants to indicate whether each word had appeared on the study list.

During the 20-min delay period of the HVLT–R, we conducted a personal list recall task, where we asked participants to recall the names of all the people they knew from their Rotary or Probus club.[1] We counted occasions where only a first name was recalled if it was clear the participant was referring to a specific

[1]In this task, we actually asked participants to recall three lists that were relevant to their history and shared knowledge: (a) the addresses of all the houses they had lived in together, (b) the places they had visited on trips, and (c) members of their Probus or Rotary club. We focused our analysis only on club members because this task provided the most readily quantifiable data. For addresses, most couples' recall was at ceiling; and for the trips, the task was often interpreted quite differently, which made comparison across recall occasions difficult.

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person. We designed this task to be a readily quantifiable memory task that was personally relevant to our participants and their autobiographical memories.

We also asked participants a series of questions about their everyday remembering practices. We asked them how much time they spend with their spouse, how much they talk about the past, the kinds of past events they talk about the most, how they deal with disagreements about the past, and whether they remember different things from their partner. We also asked them about their use of diaries, journals, and photos as memory aids.[2] We conducted Recall 4 and the recognition test from the HVLT–R (described earlier) as the final task, before asking participants whether they had any questions, explaining the procedure for the next session, and asking whether there were any events they would prefer not to talk about in the next interview. In total, Session 1 lasted for between 62 and 80 min ($M = 69.17$, $SD = 5.68$).

Session 2

In Session 2, we conducted a joint interview with both members of the couple. Both interviewers (Celia B. Harris & Paul G. Keil) were present, although Celia B. Harris led the interview and asked most of the questions. We began by asking participants whether they had discussed the tasks or memories in the two weeks since the last session. Most couples reported that they had compared performance on the word list task, and had compared which events had come up in the autobiographical interview. For the collaborative autobiographical interview, we asked couples to reminisce jointly about some of the events they had described in the previous session. We encouraged participants to talk together naturally about each event, and to work together to remember as much detail as possible, even if they had already mentioned it in Session 1. We had selected events from the individual interviews to follow up. This always included their first meeting, first date, wedding and honeymoon, as well as other significant events that had been mentioned in the individual interviews. We aimed to sample across more recent and more distant events.

We conducted the HVLT–R exactly as in Session 1, except that couples received a new list (whichever they had not received in Session 1), and the four recall occasions were collaborative. We instructed participants that they should work together to remember as many items as they could, and that they should agree on each item recalled. On the recognition task, we asked both participants to answer "new" or "old" for each item and to resolve any disagreements through discussion. Similarly, we conducted the personal list task exactly as in Session 1, except that it was collaborative. Again, we instructed

[2]Formal qualitative analyses of the complex interview data—both the autobiographical memories and the discussions of remembering practices—are ongoing, and the results are not reported here.

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participants to work together to remember as many names as they could. Finally, we asked the same series of questions about the couple's remembering practices, before conducting Recall 4 and the recognition test from the HVLT–R. We asked couples if they had any questions, discussed the aims of the research with them, and thanked them for their participation. Session 2 lasted for between 71 and 123 min ($M = 89.75$, $SD = 17.26$).

All sessions were transcribed in full from the audio recordings. Celia B. Harris and Paul G. Keil transcribed both the individual and collaborative sessions for 2 couples. A professional transcription service transcribed the individual and collaborative sessions for the remaining 10 couples. Interviews were transcribed word for word, although specific tone and pronunciation information was not marked. Overlapping speech was marked using square brackets.

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Analysis and Coding

In analyzing the quantitative data from both the word list recall task (HVLT–R) and the personal list recall task (list of club members), we calculated nominal group recall for each couple by pooling the non-redundant items recalled by the individuals in Session 1. We compared nominal group recall scores to collaborative recall scores to determine whether collaboration resulted in inhibition.

For the word list recall task, we coded whether couples used a coordinated group strategy, based on our previous findings that group strategy use was associated with better collaborative recall performance (Harris et al., 2009). Strategy use was scored as a dichotomous "yes" or "no" variable independently by Celia B. Harris and Paul G. Keil while blind to each couple's recall scores. Raters agreed 100% about which couples used a coordinated strategy and which did not. The specific nature of the strategy varied across couples. Four couples used the categories to organize and cue each other's recall (Couple 2 explicitly, and Couples 6, 8, and 12 implicitly by making reference to the relations between items). Couple 7 explicitly assigned the wife to recall the first half of the list and the husband to recall the second half. In Couple 4, where the man had a clinical memory deficit, his wife waited on each occasion for him to recall until blocked before she recalled items. In her individual interview, she described how she used this strategy in daily life to avoid disrupting his recall. In Couple 10, the man made actions for each item at encoding (e.g., a triangle for "tent" and claws for "lion") that were then reproduced to aid and cue his wife's recall during collaboration. Overall, 7 couples were classified as using a coordinated strategy and five were classified as not using a coordinated strategy.

For the personal list recall task, we developed a more detailed coding system that captured the features of each couple's interaction during collaboration on this recall task. We did not do this detailed coding for the word list recall task because the simplicity of the stimuli did not allow sufficient complexity in the

processes of collaborative recall, and the majority of utterances on the word list task were simply stating items from the list.

For the personal list task, based on Wegner et al. (1985), we coded attempts by each partner to cue the memory of the other, both explicit cuing attempts, such as a question (e.g., "What's his name? The man who just had the gallbladder?"), as well as questions implied by tone ("John Edwards, and I don't know what his wife's name is"). We coded occasions when this cuing resulted in new information. We separated this into two items: (a) new information that was *countable* in the recall task (e.g., the name of a person not previously recalled or the name of a person's spouse), which would be reflected in the recall score; and (b) new information that was *non-countable* in the recall task (e.g., the surname of a person when their first name had already been recalled; "Then there's Sylvia . . . Sylvia . . . " "Yes, Sylvia Pretty"), which would not be reflected in the recall score as it still involved the same number of club members being remembered overall. The exchange of such non-countable information, which would be missed if we measured recall amount alone, might nevertheless be a significant aspect of cognitive interdependence in joint remembering, and both countable and non-countable information indicate the success of cues.

Transactive memory theory describes how group members become experts at remembering either specific kinds of information or even whole categories of information—that is, in transactive memory systems, there is differentiation in memory (Wegner, 1987). Thus, we coded any references to one partner having particular expertise on this task. For instance, one of the men was the President of the Probus club, and knew many more of the names. His wife stated at the beginning of the recall task, "You can do that one, you'll get sick of this. He just had lunch with 43 of them," which we coded as a reference to his expertise on this task.

Prior findings indicate that group strategies can enhance recall (Harris et al., 2009), and so we aimed to identify cases where couples had a shared, coordinated group-level strategy. Because the task and the interaction were much more complex than the word list task, we coded for conflicting individual strategies, as a measure of the absence of a coordinated group strategy, rather than coding for its presence.[3] For instance, in one couple, the wife commented on their conflicting individual strategies; "Oh you're going to go alphabetically, oh dear . . . I have to go around the room."

Because of the potential importance of effective communication techniques and the dimensions scored by Meade et al. (2009), we coded for repetitions (1 partner repeating what the other had just said), acknowledgments (such as *yes,*

[3]We coded for explicit strategy agreements or evidence of group-level coordination (as in the word list task). However, these did not occur or could not be reliably identified, so we considered strategy conflict a better measure.

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uh-huh, or *right*), corrections of one partner by the other, and elaborations. We defined elaborations in a task specific way, as extraneous information produced about a person after their name had been already been recalled (i.e., not used as a cue to remember the person's name). For instance, one man recalled "Frank Postle," which his wife acknowledged as correct: "Yes, that's right." The man went on to state, "He's an Englishman," which we coded as an elaboration.

This coding system for the personal list task was developed by Celia B. Harris and Paul G. Keil based on previous findings, as well as our readings of the interview transcripts. Once the coding system had been developed, Celia B. Harris and Paul G. Keil independently coded all the transcripts while blind to the recall scores of the couple. We had good interrater reliability ($\kappa = .86$), and disagreements were resolved by discussion.

We took into account the differences between couples in their baseline recall output when computing their scores on these coded variables. This avoided some couples scoring higher on all variables simply because they talked for longer or knew more people overall. We converted the number of successful cues, failed cues, amount of new countable and non-countable information produced, acknowledgments, and repetitions into proportion scores, defined as the proportion of total turns in the interaction that were consistent with each code. However, because mentions of expertise, strategy disagreements, corrections, and elaborations occurred relatively infrequently within each interaction (with a number of couples scoring zero), they would have yielded very small proportions, so we used the raw numbers as dependent variables for these codes.

This process yielded 10 variables: (a) proportion of turns that were successful cuing attempts; (b) proportion of turns that were failed cuing attempts; (c) proportion of turns that were new, countable information in response to a cue; (d) proportion of turns that were new, non-countable information in response to a cue; (e) number of mentions of expertise; (f) number of strategy disagreements (g) proportion of turns that were repetitions; (h) proportion of turns that were acknowledgments; (i) number of corrections; and (j) number of elaborations.

RESULTS

There are three sets of data for this study: (a) word list recall: quantitative data from the HVLT–R; (b) personal list recall: quantitative data from the personal list task and qualitative coding of the way couples interacted during this task; and (c) autobiographical memory recall: qualitative data from the interviews, where couples recalled autobiographical events in detail. Across these three datasets, we focused our analysis on comparing each couple's nominal (pooled individual) performance to their collaborative performance to determine whether

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couples exhibited collaborative inhibition or facilitation.[4] We also focused on identifying factors that resulted in costs versus benefits of collaboration for memory.

Word List Recall

In the HVLT–R task, participants recalled a 12-item list on four occasions, and we chose to focus our analysis on the results of the first recall test.[5] On average, on the first recall test couples recalled 9.50 words ($SD = 1.08$) as a nominal group and 8.92 words ($SD = 2.11$) as a collaborative group. These means show a trend toward collaborative inhibition, but there is no significant difference between them, $t(11) = 0.81$, $p = .437$; although our power is low. This analysis indicates that, on average, there were no particular advantages to collaborative remembering on this task, even for these long-term couples.

However, looking across the individual couples, there were differences in the patterns of inhibition and facilitation. In attempting to account for these differences, we divided couples into groups using our coding of coordinated strategy use, which we coded while blind to recall scores. We conducted a 2 (Strategy vs. No Strategy) × 2 (Recall Occasion: nominal vs. collaborative) mixed-models analysis of variance to determine whether group strategy use predicted collaborative success. This analysis yielded only a significant interaction between strategy use and recall occasion, $F(1, 10) = 10.24$, $p = .01$ ($\eta_p^2 = .51$). We followed this up by comparing the two recall occasions separately for each strategy condition. We used a liberal alpha of .10 because of our small sample size. These follow-up tests suggested that those couples whom we identified as using a coordinated strategy tended to recall more during collaborative recall than nominal recall ("collaborative facilitation"), $t(6) = 2.12$, $p = .08$; and those couples whom we identified as not using a coordinated strategy tended to recall more in nominal than collaborative recall ("collaborative inhibition"), $t(4) = 2.22$, $p = .09$ (see Table 1).

[4]We calculated nominal recall by pooling participants' Session-1 recall, rather than testing a separate nominal group—that is, collaborative versus nominal groups was a within-groups variable, rather than a between-groups variable. This was deliberately done to maximize the power in our small sample and to take into account the large individual differences in baseline recall across couples. Although this approach does raise the possibility of practice effects, our results are not consistent with a general improvement in performance from (nominal) Session 1 to (collaborative) Session 2. In research currently underway, we are including a separate nominal group to address this potential confound.

[5]Participants had the most variability in performance on the first test; and, because the Hopkins Verbal Learning Test–Revised is a clinical neuropsychological diagnostic tool, by the fourth test, several of our healthy participants had reached ceiling. However, for each couple, similar patterns were present across recall tests.

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TABLE 1
Word List Recall: Mean Nominal and Collaborative Scores for Couples Depending on Strategy Use

Variable	*M*	*SD*
No strategy ($n = 5$)		
Nominal	10.20	0.84
Collaborative	7.60	2.70
Strategy ($n = 7$)		
Nominal	9.00	1.00
Collaborative	9.86	0.90

Note. Values are mean number of words recalled out of a possible 12.

Personal List Recall

In the personal list task, we asked participants to remember the names of as many people from their Rotary or Probus club as they could. We scored the number of names they recalled, and counted first names as correct if it was clear they were referring to a specific person. Data from 2 couples were eliminated: one because they could not recall any names, and the other because they were members of two clubs and responded for different clubs in the different sessions. Scores for the 10 remaining couples are presented in Table 2. On average, couples recalled 26.90 names ($SD = 16.05$) as a nominal group and 26.80 names ($SD =$

TABLE 2
Autobiographical List Recall: Nominal, Collaborative, and Proportion Difference Personal List Recall Scores for Each Couple

Couple	*Nominal*	*Collaborative*	*Proportion Difference*
1	18	28	0.36
2	50	32	−0.56
4	54	53	−0.02
5	11	12	0.08
6	30	38	0.21
7	11	11	0.00
8	12	16	0.25
10	23	20	−0.15
11	20	29	0.31
12	40	29	−0.38

Note. Values are total number of names recalled by each couple and the proportion change from nominal Recall 1 to collaborative Recall 2.

12.83) as a collaborative group. There is no significant difference between these means, $t(9) = 0.04$, $p = .973$. Although there was no evidence for collaborative inhibition, there was no overall advantage to collaborative remembering, even for this personally relevant information (see Table 2).

However, looking across the individual couples, there were differences in the patterns of inhibition and facilitation (see Table 2). Because baseline recall for each couple was quite different, we calculated a recall performance score that took this into account. For each couple, we calculated the difference between collaborative and nominal group recall, such that a negative number indicated collaborative inhibition and a positive number indicated collaborative facilitation. We divided this difference score by the couple's total collaborative recall, so that the outcome variable was the difference score as a proportion of overall collaborative recall (see Table 2).

As described earlier, we calculated couples' scores on each of the 10 interaction variables. Couples' scores on each item are presented in Table 3. It is interesting to note that across couples, failed cues were just as common as successful cues, indicating that even these intimate dyads, recalling personally relevant information, were not always successful at cuing each other. It is also interesting to note that the most common utterances appeared to be repetitions, accounting for up to 23% of turns in the case of Couple 1.

To determine the relations among our coded variables, we conducted a principal components analysis, using a varimax rotation and an eigenvalue criterion of 1.[6] This yielded a three-factor solution, which accounted for 74.16% of the variance. Factor 1 included strategy disagreements, the nomination of an expert, corrections, and (negatively) the proportion of failed cues ($\alpha = .72$). Factor 2 included the proportion of successful cues, new countable information and new non-countable information produced in response to cues, and repetitions ($\alpha = .74$). Factor 3 included acknowledgments and elaborations (alpha not applicable for 2 items only). Given the relatively small number of items on each factor, and the limited range of scores for certain items, these alphas indicate good inter-item reliability. Items loaded strongly on their respective factors (see Table 4). We also obtained standardized component score coefficients from the factor analysis by converting each item into a z score and using these to calculate the score on each factor for each couple. This allowed us to profile each couple's interaction. These factor scores are presented in Table 5.

[6]We also coded a number of additional variables that were excluded from analyses because they did not load strongly on a single factor in the factor analysis. These included positive and negative meta-statements about memory performance on this task (e.g., "I reckon if we concentrated, we would get the whole ninety of them"; "We are not doing very well at this") and attempts to end the recall task ("That's enough now, isn't it?"). Removing these variables gave the cleanest set of factors with strong item loadings on each.

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TABLE 3
Autobiographical List Recall: Scores on Each Interaction Variable for Each Couple

	Proportions						*Frequencies*			
Couple	*Successful Cues*	*Failed Cues*	*Repetitions*	*Countable Information*	*Non-Countable Information*	*Acknowledge*	*Strategy Disagree*	*Elaborations*	*Expert*	*Corrections*
1	.08	.04	.23	.13	.08	.06	0	2	0	1
2	.03	.00	.11	.00	.03	.20	2	3	2	0
4	.04	.08	.13	.02	.04	.14	0	7	0	0
5	.04	.04	.09	.09	.00	.00	1	2	2	2
6	.07	.07	.09	.10	.02	.03	0	4	0	0
7	.02	.04	.04	.02	.02	.02	0	1	0	0
8	.10	.02	.12	.07	.10	.10	1	1	1	1
10	.02	.10	.14	.00	.02	.00	0	1	1	0
11	.05	.05	.20	.07	.02	.00	0	1	1	2
12	.03	.03	.10	.01	.04	.03	6	2	2	4

Note. Values indicate proportion of turns in the collaboration consistent with each code or the frequency of codes in each couple's collaboration.

TABLE 4
Autobiographical List Recall: Component Matrix for Factor Analysis

	Rotated Component Matrix		
Variable	*1*	*2*	*3*
Successful cues	−.028	.922	.055
Failed cues	−.747	−.262	−.265
Countable information	−.206	.807	−.314
Non-countable information	.149	.789	.359
Expert	.813	−.292	−.119
Strategy disagree	.882	−.216	.002
Repetitions	−.076	.622	−.105
Acknowledge	.169	.072	.964
Corrections	.748	.086	−484
Elaborations	−.319	−.139	.654

Note. Values indicate loadings of each variable on each factor in the rotated component matrix.

To determine the relation between these interaction factors and recall output, we conducted a linear regression and entered the three factors from our factor analysis stepwise. This regression analysis indicated that the model that explained the most variance included all three factors: Factor 1 ($\beta = -.49$), $t(9) = 3.69$, $p = .010$; Factor 2 ($\beta = .70$), $t(9) = 5.27$, $p = .002$; and Factor 3 ($\beta = -.39$), $t(9) = 2.93$, $p = .026$; all significantly predicted the difference between collaborative and nominal recall. This model explained a significant proportion of the variance in difference scores ($R^2 = .839$), $F(3, 6) = 16.65$, $p < .01$.

TABLE 5
Autobiographical List Recall: Scores for Each Couple on Each Factor

Couple	*Factor 1*	*Factor 2*	*Factor 3*
1	−0.34	1.89	−0.16
2	1.00	−0.61	1.72
4	−1.04	−0.43	1.60
5	0.38	−0.37	−1.02
6	−1.08	0.18	−0.08
7	−0.57	−0.91	−0.21
8	0.58	1.52	0.52
10	−0.91	−1.03	−0.80
11	−0.01	0.38	−1.10
12	2.00	−0.60	−0.48

Note. Values are standardized z scores for each couple on each factor.

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We conceptualized Factor 1—expert, strategy disagreements, corrections, and a lack of failed cues—as a "group-diminishing" factor. The presence of these features did not allow the couple to collaborate in an interactive way or to cue each other effectively, and it seemed that these features were associated with a lack of cohesion. Factor 1 had a negative relation with recall output. The fact that failed cues contributed negatively to this factor indicates that the absence of failed cues predicted poorer collaborative recall, perhaps because a willingness to attempt to cue during collaboration was important for its success and because the other group-diminishing items did not create a recall environment where cuing was attempted. We conceptualized Factor 2—successful cues, new countable and uncountable information produced in response to cues, and repetitions—as a "group-enhancing" factor. The presence of these features indicated that the couple was interacting dynamically to perform the recall task and explicitly utilizing each others' knowledge. Factor 2 had a positive relation with recall output. Factor 3—acknowledgments and elaborations—was a little less clear, and we were surprised that these features predicted worse collaborative recall performance. We speculated that Factor 3 might be a gap-filling or relationship-maintaining factor, indicating the utterances that did not contribute to the recall task at hand but that did perhaps contribute to other, more social goals (e.g., see also Gould & Dixon, 1993; James, Burke, Austin, & Hulme, 1998).

To illustrate the way that these interaction factors influenced the dynamic of collaborative recall during the autobiographical list task—producing either facilitation or inhibition—we now present extracts from the collaborative recall of two couples. These couples represent dramatic examples of the way that these interaction variables influenced collaboration, although our regression analysis indicated that these variables were associated with recall performance across our sample. The scores for each couple's nominal and collaborative recall can be seen in Table 2.

Couple 1 adopted an interactive style, where they dynamically constructed the list of names and frequently switched speaker back and forth. On a number of occasions, they used a specific cross-cuing strategy where the man recalled a man's name and the woman responded by recalling the man's wife (see bolded sections in the following transcript). This couple also cued each other using their shared background knowledge, and frequently used repetition (see bolded sections in the following transcript):

F: OK, who is that fellow . . . oh, **Peter and** . . . **Peter that was there the other day** . . .
M: Oh, Peter um . . .
F: Judy! Peter and Judy.
M: Horsley.
F: Yeah.

M: There's **Peter the pilot.** Umm . . .
F: **Peter and Mary**. I don't know their surname.
M: He's a retired Qantas pilot.
F: And ok, **that fellow whose son used to work with you** . . .
M: Oh, ah, [Bruce]
F: [Bruce]
M: Curtis.
F: And I don't know his wife.

Of the 10 couples we studied in this task, Couple 1 scored the highest on Factor 2 (see Table 5), demonstrating successful cuing resulting in the production of new information and frequent use of repetitions. Couple 1 demonstrated the strongest collaborative facilitation for this task (see Table 2).

In contrast, Couple 12 adopted two distinct and conflicting strategies when completing this task. The man attempted to recall the names alphabetically, which suited him because he was accustomed to seeing the members' list. His wife attempted to recall the names by picturing the faces of people in the room at the meetings, but her attempts to recall were discounted because they disrupted his individual strategy (see bolded sections in the following transcript). Here is an extract from their interaction:

F: The Lane's, the Alexander's.
M: **Oh start again**, Alexander, Daryl Alexander, Rosa Avalos.
F: **Oh you're going to go alphabetically, oh dear.** (laughing)
M: Carlo Bongagoni, Malcolm Bush.
F: **I have to go around the room**.
M: **You're really going to help me aren't you?** (laughing)
F: (laughing) Well you're lost, you're up to B, C.
M: C, is there any C's, Alison Clarke, yes, D's, John Darragh, E's, oh sorry, Frederick Bensalem, there's a B. Umm, John Darragh, umm, [what comes after D, E, F, F, G.]
F: [**I have to see faces to put names to them**.]
M: Peter Good, I missed him last time, Peter Good.
F: Peter Stephenson.
M: **Well wait, just stay in the G's.**

Of the 10 couples we studied in this task, Couple 12 scored the highest on Factor 1 (see Table 5), demonstrating uneven expertise and strong strategy disagreement. They scored negatively on Factor 2 (see Table 5), indicating that they did not use cues to recall together. Couple 12 also demonstrated strong collaborative inhibition on this task (see Table 2).

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Autobiographical Interview

In the autobiographical interviews, we identified many examples of the interaction variables that had predicted performance on the personal list task. Studying occurrences of these variables in a more naturalistic, conversational context provided particular insight into the dynamic way in which these interaction variables served to enhance or diminish collaborative recall, although we note here that they serve as illustrative examples and should be interpreted cautiously given our case-study approach. It is also worth noting that it was difficult to characterize each couple as successful or unsuccessful collaborators. Although there were consistent patterns across tasks for each couple, even couples that seemed to collaborate very successfully and interactively had moments where they lacked cohesion and did not collaborate successfully; and couples who collaborated quite poorly in general, jointly and interactively constructed their recall of certain events—that is, recall performance was task-specific.

Factor 1

Expertise. In the personal list task, we found that references to one person having particular expertise resulted in poorer collaborative recall performance. Across the autobiographical interview, for certain couples and certain events, we found instances where one member of the couple was perceived (by the couple) as the expert. In these cases, the identification of an expert led to monologues in remembering, not allowing joint remembering as a genuinely interactive, group process. Consider, for example, the following example from Couple 7, discussing a car accident they had in which the woman was badly injured. Because of the woman's injuries, she had an incomplete memory for this event, and so the man assumed responsibility. During the collaborative interview, he spoke more than 1,700 words about this event, with little interjection from his wife—almost word for word what he said in the individual interview. When she did attempt to contribute, he did not utilize her input and did not incorporate it into his own recall:

M: And [wife] of course was in a micro sleep and woke up as well and also over corrected and so with me holding the wheel to try and get it back on left hand side and [wife] over correcting and we were doing about probably 110 . . .
F: Did I wake up?
M: Oh yes very briefly, I mean, 110 km/h and we rolled three times . . . [and ah]
F: [I thought] you ah, you, you grabbed it!
M: (raises voice) we're always grateful, always grateful that there was not a car coming the other way because we would have had a head on collision

> and ah, I, I remember very vividly the car rolling over and ah, ah, and ah, the strongest memory was when we came to a stand the car rolled three times . . .

Later, when directly questioned by the interviewer, the woman did report being able to recall this event—and remember it vividly—although she had not contributed to the collaboration:

> F: There are things that stick out like sore thumbs that are almost like it was yesterday. I do remember [husband] grabbing the wheel, it was the first time I ever heard him say that I woke up and grabbed the wheel.

In his individual interview, the man explained his perception of differences in their experiences of this event and their relative memories for it:

> M: [yeah well it was], and she'll remember, she'll talk to Celia about that I'm sure, she would remember some of that, but in not quite the same detail that I remember it.

This example demonstrates how the perception of uneven expertise hampered joint remembering, making it essentially the same as the expert's individual recall. During collaboration, the expert did not capitalize on the knowledge of the non-expert, even when she attempted to contribute; and the non-expert did not attempt to cue the expert's recall.

Also relevant to issues of expertise, we asked couples about the way that remembering is distributed between them, and particularly about whether they are responsible for remembering different things. The idea of a division of remembering work was readily recognized by our couples—they could describe differences in their memories. The man from Couple 1 described the following:

> M: We remember different things—I remember facts and figures, [wife] will remember what I term "color," and I guess when you marry those two together you have pretty much the full story, don't you.

Also, the woman from Couple 3 described the benefits of this shared responsibility for remembering:

> F: Well I suppose we do help each other with memories, don't we. One will remember what the other's forgotten. And when you [husband] tell me what the name of the house was I can sort of see it all again and the road it was in.

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Together, these imply that differentiation of expertise was not necessarily problematic for collaborative recall. If both partners were recognized as experts at remembering different aspects of events, collaboration could be aimed at combining and integrating their individual memories. What seemed to be problematic for collaborative recall was incompatible expertise, or a lack of shared understanding of and ability to capitalize on each individual's relative knowledge and skills. This hampered genuine collaboration.

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Corrections. Similarly, correction of one partner by the other did not seem to allow successful collaboration, serving to truncate or abort the remembering attempt. Consider the following excerpt, again from Couple 7, attempting to jointly recall their first date:

M: yeah, well, it was a sort of classic movie of its time.
F: [No] it was [a stage production].
M: [and a] and one that's been very popular for us ever since, you know, frequently watch it if it's on television or [*inaudible*].
F: [Not South] Pacific, we watch my ...
M: Yeah, I'm talking about ahm ... *Sound of Music.*
F: That was for our engagement 7 years later.
M: Yeah ok.
F: We were talking about the first.
M: Oh I see alright, OK. We saw *Hatari* pretty early on.
F: Yeah we did (sarcastic tone).
M: Cause I remember we had all sorts of problems with that. The seats that I got were right on the very side of the cinema and it was very difficult to see.
F: [I thought] that was two years into the relationship.
M: But yeah, OK well as I said that's the thing but going to the movies early on was a common way of sharing our enjoyment with one another.

In this example, the continued correction of the man by the woman does not allow for joint remembering, and they fail to provide a joint narrative for the event that they had been asked to describe.

Perhaps one reason that corrections were problematic for collaboration is that across interviews, we found that couples did not consider precise accuracy in recall to be the most important aspect of joint remembering. Corrections may not in the spirit of everyday joint remembering, which might more often be aimed at telling an entertaining or coherent story rather than achieving strict historical accuracy. The man from Couple 2 explained:

M: I remember we used to have a rule that if we're telling a story and I say there were ten wild dogs in the back garden, I don't want [wife] to tell me, no, there's only two. I said if I'm telling a good story and I said there were ten wild dogs, there were ten wild dogs.

We also asked couples how they dealt with differences in their memories for events, and most said that they did not particularly try to resolve disagreements over minor details. This supports the idea that precise accuracy is not of primary importance in the context of day-to-day remembering, particularly for these older couples (e.g., see James et al., 1998).

Strategy disagreements. We also found examples of strategy disagreements in the autobiographical interviews. Consider the following excerpt from Couple 2 (Q = the interviewer):

(Q: Last time, we talked a little bit about when you graduated, your graduation day from medicine. Can you remember that now, because obviously you were both there the same day?)
M: Yes, yes.
F: Coming from different hospitals.
M: Yes, yes, I mean I can, it was, I mean I can remember the actual day the results came out. You know we had to go out the Sydney University.
F: Well we're talking about graduation day though, graduation day was in February the next year.
M: Are you talking about when we went to the Great Hall to graduate.
F: Hmmmm.
M: Well I'm just going back one more. I'm going to the actual graduation day, [because this group we had].
F: [You mean the result day].
M: The result day, yes, [when the results came out].
F: [The final results].
M: You had to go out to the University and see if you'd got through, if your name was on the board. And I remember we went out there, this is very important to me (laughing), and the name was on the board and that was fantastic.

In this example, the man and woman interpreted the interviewer's question in different ways, and began to recall different events. This disagreement took some turns to be resolved, and the man continued to recall the story of the results day with little input from his wife. It turned out he had an agenda in telling this story—he proposed to her later that same day.

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Factor 2

Cuing. Previously, in the personal list task, we found that cuing and the production of information in response to cues resulted in better collaborative recall performance. Across the autobiographical interview, we could identify many examples of cuing. In fact, for all couples there was at least one event that they collaborated to recall in a dynamic, interactive manner, where the speaker role rapidly shifted back and forth and the narrative was jointly constructed. Consider the following brief examples from Couple 11, discussing the beginning of their relationship:

M: No, I asked her out that night, but she said she couldn't go.
F: No, that's right.
M: So then I started to pester her the next week.
F: You did, you turned up after my [classes].
M: [Cooking classes.]
F: On Monday night.
M: That'd be it.
F: And took me for coffee.
M: Yes, the next Monday night.
F: And impressed me.
M: Yes.

Compare this collaborative recall to the way this same event was described in their separate individual interviews:

M: Ah, I used to turn up down her, she used to give, umm, what do you call it, teaching, she used to teach, umm, women in Manly how to cook. So she ran teaching classes. So I used to turn up there after, and take her out for coffee or something.
F: And then the next week he appeared at my work after the evening class had finished, taking me out for coffee—that was the beginning of the courtship.

The description of this event in the collaborative interview was more specific, mentioning the day of the week, compared to the more general description provided in the individual interviews. It was also emotionally richer and more detailed than the individual descriptions of the event, including the descriptions of his "pestering" and of her being "impressed."

On a few occasions, we could identify instances where this cross-cuing led the couple to remember details that both individuals explicitly stated they had

forgotten. Consider the following exchange from Couple 8, who jointly discussed their honeymoon 40 years before:

F: And we went to two shows, can you remember what they were called?
M: We did. One was a musical, or were they both? I don't . . . no . . . one . . .
F: John Hanson was in it.
M: *Desert Song.*
F: *Desert Song*, that's it, I couldn't remember what it was called, but yes, I knew John Hanson was in it.
M: Yes.

In these cases, the cuing came about naturally in the joint construction of the event. This contrasts with the cuing in the more task-driven personal list task, which was often explicit. In general, this implicit process of collaborative cross-cuing and co-construction seemed to produce elaborations and new information, and to lead to more detailed, episodic, emotionally richer recall.

Repetition. We also found examples that illustrate the way that repetition functioned as a form of engagement and cross-cuing. When an individual repeated something their partner had just said, they commonly used this repetition as the basis for continuing the narrative and elaborating on the repeated information. Consider the following example from Couple 1, jointly recalling their wedding day:

M: [Name], who was . . . [a good friend of ours]
F: [the musical director of Channel 9]
M: Channel 9, yeah, came and ah . . .
F: . . . played the organ . . .
M: . . . played the organ in the church.
M: And I think we were the . . .
F: I walked down the aisle to the theme music that Channel 9 used that year . . .
M: [. . . the next year. . .]
F: [this is the place to be] This is the place to be in 1973! and that was what I walked down the aisle to.

In this example, the use of repetition allowed each person to pick up and continue the narrative, acknowledging it and using it as a cue to elaborate on what their partner has just said.

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Factor 3

Acknowledgments. It was interesting that in the personal list task, acknowledgments (along with non-task relevant elaborations) were negatively correlated with performance. We had expected that acknowledgments were similar to repetitions and might indicate engagement. In fact, it seemed that acknowledgments were unhelpful, and we speculated that they were a "filler" technique. An example from the autobiographical interview task illustrates this. Consider the following excerpt from Couple 8:

M: [I just tried to remember the,] umm, walking up park side.
F: Oh yes, from the bus, yes.
M: Yes.
F: And it was snowing, yes.
M: Yes.
F: Well we'd been to the football, but we'd, we hadn't been to the football together but we got the same bus back, but we'd actually both been to the football match, yes. And it started to snow didn't, yes, and he gave me his scarf to put over my head. Do you remember that?
M: No, not really.

In this case, although the man repeatedly acknowledged his wife's recollection of this event, this acknowledgment did not indicate that he was concurrently remembering. In fact, he could not recall the event. Although we were surprised that acknowledgments were associated with Factor 2 (see Table 4) and so predicted poorer recall (see Table 5), this finding is consistent with Clark and Schaefer's (1989) characterization of acknowledgments as providing a weaker evidence of understanding than other listener responses, such as repetition; and, perhaps acknowledgments serve social functions, rather than contributing to remembering as much as possible in the recall task (see Gould & Dixon, 1993).

Distribution of memories. In the autobiographical interviews, we also found examples that illustrate potential ways that memories can be shared and distributed in these long-term couples. In some cases, individuals claimed to have memories for events that they themselves had never experienced. Consider the following example from Couple 11, where the husband corrected his wife and claimed memory for an event that he did not experience himself:

F: I didn't have a passport, oh yes I did have a passport.
M: Yes you did, you'd been on a cruise, dear.
F: I did, I had a passport. [That was my new passport.]

M: [See how's that for a memory.]
F: Wonderful dear.
(Q: Hmmmm, because I remember you said that Fiji was your first time out of Australia, umm, but, umm.)
F: I forgot about the cruise, that was the first time on an airplane, on a big airplane.
M: Yes, you went there [on a cruise before.]
F: [I did, I went on a cruise.] I forgot all about that. Gee, it couldn't have been very memorable.
M: I remember.
(Q: Were you there?)
M: No.

Similarly, both members of Couple 2 more specifically described the inherently shared nature of their memories, attributing this cognitive interdependence to their shared experiences. The woman stated, "Each could tell the other's stories"; and, later, her husband described the following:

M: Hmmmm, well what we find is because we've done everything together someone will start telling a story, and then the next person will try to take over and tell another funny part of the story, and if you're not careful you don't know who has the right to the story.

Functions of shared remembering. Our interviews also provided insights into the broader functions of joint remembering. Couples described the role that remembering played in their relationship. For example, in his individual interview, the man from Couple 1 described the role of remembering in their relationship:

(Q: How often do you talk about the past together with [wife]?)
M: A lot. We're big talkers. That has always been a big point of our lives, still is!

We also saw an example suggesting that joint remembering could be associated with intimacy. In her individual interview, the woman from Couple 7 described how recent difficulties in their relationship had resulted in less day-to-day reminiscing with her husband:

(Q: Do you tend to reminisce together?)
F. Not as much as we used to.
(Q: OK, so it's kind of changed you think.)

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F. Yeah I do. Yeah there were some circumstances that changed it, a couple of years ago, which were really not, not happy for me, and not happy for him.

This is consistent with Wegner's (1987) finding that couples who were less satisfied with their relationships showed less evidence of an effective transactive memory system.

Summary. Overall, these examples provide a powerful illustration of the complex ways that features of a couple's interaction can influence the outcomes of collaboration. In the autobiographical interview, we found many examples of Factor 2 (group-enhancing) variables: Couples often successfully cued each other to remember additional details, and repetition was used to conduct the collaboration in a dynamic manner, where the speaker switched rapidly back and forth and the narrative was produced jointly. However, we also found examples of Factor 1 (group-diminishing) variables, where incompatible expertise, corrections, and conflicting recall strategies interfered with successful collaboration; and, our example of the Factor 3 variable—acknowledgments—is consistent with our interpretation of this as a "gap-filling" factor.

DISCUSSION

We studied shared remembering in established, long term married couples. Across three different tasks, we found some instances of collaborative inhibition and some instances of collaborative facilitation. Certain ways of interacting during collaborative remembering were associated with better recall performance. Particularly, the use of shared strategies (on the word list task) and other Factor 2 variables—successful cuing and repetition—were associated with collaborative facilitation. Factor 1 variables—incompatible expertise, strategy disagreements, corrections, and an absence of failed cuing attempts—were associated with collaborative inhibition, as were Factor 3 variables—acknowledgments and recall of extraneous information.

These results temper the robust findings of collaborative inhibition in previous studies (Basden et al., 2000; Harris et al., 2008; Weldon & Bellinger, 1997). Collaborative inhibition is not an inevitable consequence of joint remembering. Rather, certain aspects of the interaction are associated with more successful collaboration (see also Meade et al., 2009). We expected that collaborative inhibition might be present for word list tasks, but might be abolished completely in more genuinely autobiographical tasks for these long-married couples. In fact, we did not find uniform collaborative inhibition in any of our tasks, even in the most simple word list recall task. This suggests that it is not

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simply the personal relevance of memories that is most important in determining whether collaboration results in inhibition or facilitation, although certain kinds of memories might be more or less susceptible. Overall, our findings point to the complexity of social memory phenomena.

Our adaptation of the collaborative recall paradigm also brings together previous findings from the transactive memory and collaborative recall literatures. A handful of transactive memory studies (Hollingshead, 1998a, 1998b; Wegner et al., 1991) have supported the idea that effective shared remembering systems develop in couples. However, these experiments have not included the nominal group comparison used in the collaborative recall paradigm. Thus, although transactive memory experiments have suggested that couples can share remembering more efficiently than strangers, they have not indicated whether couples can remember more effectively together than they would have alone—that is, whether couples show collaborative inhibition or not. Research in the collaborative recall paradigm has yielded mixed findings about whether groups with a prior relationship experience collaborative inhibition when remembering together (Andersson & Rönnberg, 1997; Gould et al., 2002; Harris et al., 2009). The current findings indicate that simply having a long-standing intimate relationship does not necessarily abolish collaborative inhibition. Even our long-term couples, who were collaborating to recall information relevant to their shared past, sometimes demonstrated collaborative inhibition. Thus, relationship alone is not sufficient to bring about benefits of collaboration (Harris et al., 2009).

We identified a number of interaction variables that contributed to collaborative success. Consistent with previous research (Gagnon & Dixon, 2008; Harris et al., 2009), we demonstrated that across tasks couples that used a shared strategy recalled more during collaboration. We operationalized shared strategies differently in the two quantitative tasks. In the word list recall task, we coded for the presence of a coordinated strategy. Because of the categorized nature of the stimuli, this was relatively straightforward. In the more complex personal list task, strategy use was less clear and less explicit. For this task we coded for the absence of a shared strategy by counting strategy disagreements. In the word list task, couples that used a shared strategy demonstrated collaborative facilitation, whereas couples who did not demonstrated collaborative inhibition. In the personal list task, strategy disagreements were associated with poorer collaborative recall.

These findings suggest an important distinction that is not present in the collaborative recall literature: collaborative performance is not only about the similarity of individual retrieval strategies (Basden et al., 1997). It is true that, in some cases, separate individual strategies were disruptive and resulted in poorer recall performance: Consider Couple 12, who also used distinct individual strategies on the personal list task, to the detriment of their recall. However, perhaps more interesting are other cases in which successful collaboration can

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occur when individual strategies are quite different: Consider Couple 1, where the man mostly recalled the men in the club, which cued his wife to remember their wives; or Couple 4 whose word-list strategy involved keeping their recall separate to avoiding disrupting the memory-impaired male partner. Our data suggest that what is more important than the similarity or differences between individual strategies is the presence or absence of a group level strategy that coordinates recall and capitalizes on the relative knowledge and skills of individual group members. This view is consistent with the focus on meta-memory in transactive memory theory. Although each group member might store different information, an efficient transactive memory system requires a shared understanding of higher order information regarding the relative distribution of knowledge and remembering responsibility—a shared understanding of relative expertise (Wegner et al., 1985); that is, transactive memory requires sharing at a higher, group level, even when individual memory might be unshared.

Our findings also suggest an important distinction that requires further clarification in the transactive memory literature: whether these group-retrieval strategies are implicit or explicit. This distinction between implicit and explicit processes has similarly been made in literature on meta-memory (Reder & Schunn, 1996), which is related to transactive memory because both concepts involve knowledge about one's own (or one's group's) cognitive processes. Implicit here refers to processes for which one has no reportable awareness, whereas explicit processes can be reported and described (Reder & Schunn, 1996). In Wegner's early descriptions of the transactive memory system (see Wegner, 1987; Wegner et al., 1985), it is unclear whether he intended the transactive memory system to be implicit or explicit, although he illustrates cases that appear to encompass both implicit and explicit processes (Wegner, 1987). However, Wegner et al. (1991) described the transactive memory system as necessarily implicit and suggested that explicit, experimenter-imposed retrieval strategies impaired collaborative recall in couples. Going further, Hollingshead (1998a) found that intimate couples actually collaborated less effectively when they were given the opportunity to discuss strategies during encoding. She attributed this attempt to make implicit transactive processes explicit as impairing joint recall in couples; for strangers (without a transactive memory system) discussion and the development of explicit strategies was beneficial (Hollingshead, 1998a). However, the suggestion that efficient transactive systems are necessarily implicit conflicts with research in two other domains. In the organizational literature, transactive memory is assumed to be explicit because self-report scales about division of responsibility have been developed to assess transactive memory in work groups (Lewis, 2003). In addition, Gagnon and Dixon (2008) found that explicit strategies can aid collaborative recall in older couples.

In our study, some couples used implicit coordinated strategies and others used more explicit strategies. We considered strategies as implicit if there was

clear, recognizable coordination in recall but no strategy was mentioned. An example of implicit strategies is Couple 1 recalling their club members. It is clear that the man recalls the men in the club, and the woman uses this as a cue to recall their wife. However, they did not discuss or agree to this strategy—it emerged in the process of their collaboration. We considered strategies as explicit if couples talked about a strategy, such as when one woman stated, "I'll do the first half and you do the second half," during the word list recall task. Regardless of whether they were implicit or explicit, strategies seemed to be effective and contribute to better collaborative recall performance in older couples. Our data were not consistent with Hollingshead's (1998a) argument that, in couples, explicit strategies impaired collaborative recall. However, we did not set out to directly test this issue, so future research could follow up the relative benefits of implicit versus explicit group recall strategies.

In terms of transactive memory, we found evidence for the importance of both shared knowledge and effective communication in determining the outcomes of shared remembering (Cooke et al., 2007; Meade et al., 2009; Wegner, 1987). It is significant here that our participants were collaborating to recall events that they had—in many cases—experienced together and talked about before. Couples reported the "interdependence" of their memories (cf. Wegner et al., 1985) to the point where even unshared events had become shared through subsequent conversations. On the occasions when knowledge was unshared, such as when there was not a shared perception of the distribution of knowledge and relative expertise, collaborative recall performance suffered; and when communication was efficient, such as when the couple used cuing and repetitions, collaborative recall performance was better; that is, both factors—knowledge and communication—appeared to be contributing to the outcomes of collaboration. The factor analysis we used imposed orthogonality, which was necessary because we used the factors as predictor variables in the regression analysis so they could not be correlated. For this reason, we were not in a position to directly test the relation between unshared knowledge and efficient communication like cuing. Further research is required to understand the relation between shared knowledge and communication, and how each contributes to an efficient shared remembering system. However, in summary, we did see evidence for the benefits of shared remembering as predicted by transactive memory theory.

We found that collaborative facilitation was not necessarily stable across tasks or events; collaborative performance differed in topic-, task-, and context-dependent ways. This contrasts with the assumption in the transactive memory literature that an efficient transactive memory system can be captured in a scale (Lewis, 2003), as a dimension that groups either have or do not have. The distinctions we drew earlier provide a starting point for understanding why collaborative performance differs across tasks and contexts. In particular, the relative distribution of knowledge and expertise differed across recall tasks.

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Thus, although a couple may have effectively collaborated when they had shared knowledge (or at least when they shared an understanding of their relative expertise), this same couple may have not efficiently collaborated on a different task when they did not have such a shared understanding.

We also considered the functions of autobiographical remembering, which may provide a key to understanding the task- and topic-dependence of collaborative facilitation versus inhibition. Complete and accurate remembering are only two of a possible range of goals when remembering (Alea & Bluck, 2003), and may not be the most relevant goals for older adults in particular (James et al., 1998). It may be that when recalling certain events, couples were motivated to remember as much as possible; whereas for other events, other motivations may have been more important. For instance, consider the example we discussed earlier, when Couple 2 talked about their graduation day. This couple were effective and interactive collaborators for most of the interview; but, in this case, they lost synchronicity, talking about completely different events. This could be traced back to their different goals in recalling—the woman focused on accurately responding to the interviewer's question, whereas the man interpreted the question loosely in order to focus on recalling an event that was more entertaining and more relevant in the history of the relationship. The importance of a functional approach to understanding shared remembering is also highlighted by couples' attitudes toward accuracy—they reported that this was not the most important aspect of shared remembering. Generally, the functional approach to shared remembering emphasizes that the effects of collaboration may not be consistent across tasks or across remembering occasions.

Our quantitative tasks provided us with strong results—albeit tempered by our small sample and case-study approach—and indicated that many couples could collaborate effectively, contrasting with the general finding of collaborative inhibition in previous research (Basden et al., 2000, Weldon & Bellinger, 1997). Instead, particular features of the interaction were associated with either collaborative inhibition or facilitation (see also Meade et al., 2009). Looking across our in-depth autobiographical interviews, we could see some evidence that these same factors were influencing recall in a more naturalistic, conversational remembering task, and these examples provided powerful illustrations of the way that these factors might operate in day-to-day remembering.

In adopting a case-study approach and only interviewing 12 couples, we had the opportunity to examine, in detail, individual differences in collaboration and how different communication and recall strategies resulted in collaborative inhibition or facilitation. However, this approach limits the generalizability of the claims we make. Future research could focus on replicating these results with larger numbers, and with manipulating the factors we found to be important, to test their contribution to collaborative success. For instance, we focused only on older adults to maximize the length of the couples' relationships, but future

research could test the impact of age and length of relationship on collaborative performance. Previous research has suggested that collaborative inhibition occurs for both older and younger adults (Meade & Roediger, 2009), even when collaborating with a spouse (Ross et al., 2008). Our finding that older couples can collaborate successfully is consistent with Johansson et al.'s (2005) research suggesting that individual difference factors predict when older couples show benefits of shared remembering. Compared to younger couples, we might expect that older couples are more likely to be advantaged by recalling with their spouse because it may allow compensation for their individual cognitive decline (Dixon, 1996), and because the length of their relationship may result in a stronger transactive memory system and more cognitive interdependence (Wegner, 1987). However, this remains an empirical question that we are following up in current research.

Another limitation is our task order, where collaborative recall was always second. We did this to avoid carry-over effects of collaboration on individual recall (see Basden et al., 2000), but it raises the possibility of practice and fatigue effects. Simple practice effects seem an unlikely explanation for our results, as effects varied across tasks and across couples and there was not simply uniform improvement across testing sessions. However, in current research, we are following up this issue by testing a larger sample and including a separate nominal group to control for practice effects.

Overall, we found evidence that collaboration can result in facilitation rather than inhibition (see Meade et al., 2009). However, even among our long-term married couples, collaborative inhibition was sometimes evident, indicating that prior relationship alone does not overcome collaborative inhibition on all tasks or in all couples. Certain interaction styles resulted in successful, facilitatory collaboration, especially the use of strategies and cues. Other interaction styles resulted in unsuccessful, inhibitory collaboration, especially corrections, disagreements and incompatible expertise. Our future research will focus on following up these results with a more formal, controlled experimental study of both older and younger couples and strangers. However, overall, our findings support the benefits of an efficient, shared remembering system and the use of group-level rather than individual-level strategies (see also Wegner, 1987), and provide rich insight into the complexity of shared remembering in intimate groups and the broader functions of shared remembering in everyday life.

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