



## Reply

## The applied value of collaborative memory research in aging: Considerations for broadening the scope<sup>☆</sup>



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The goal of our target review was to bring attention to the applied value of collaborative memory research in aging. We outlined a four-step approach toward iteratively bridging laboratory and applied collaborative memory research that calls for interdisciplinary collaboration and involves: (1) *complementing* laboratory based collaborative memory paradigms with ecologically valid paradigms, (2) *evaluating* these paradigms in applied settings, (3) *adapting* these paradigms for clinical populations, and (4) *modifying* these paradigms for functional neuroimaging environments. This action-oriented approach focused on individual memory performance following collaboration – rather than group processes and group products per se – and has the potential to generate increasingly more targeted interventions for improving memory in aging. In this reply, we discuss five key ideas or recommendations put forth across the six commentaries; namely, to consider: (1) group processes or group products as a unit of analysis, (2) different forms of memory and cognitive functions, (3) computational approaches to collaborative memory, (4) whether the field as a whole is ready to bridge the gap between laboratory and applied collaborative

memory research, and (5) the value of examining the neural systems that operate during collaboration in aging.

Several commentary writers (Barnier et al., 2013; Dahlström, 2013; Dixon, 2013; Hirst, 2013; Meade, 2013) point out (and accurately so) that group processes and group products are not given enough attention in our four-step approach toward bridging laboratory and applied collaborative memory research in aging. We too recognize the value of examining group processes and products. We chose to focus on post-collaborative individual recall, however, because at this time this is what is best explicated in basic research through theory and experimentation, and because we wanted to leverage this foundation toward an action-oriented approach that could inform (in the immediate future) the development of interventions that involve collaboration. We were also cognizant of the challenges associated with examining group products. As noted in Meade's commentary, for example, classification of group process variables is often based on verbal protocols, and there are few agreed upon methods for classifying such variables across studies and laboratories. Consequently, group products are currently most useful for exploratory, descriptive, and development purposes. As standardized methods for classifying group process variables become more developed, we agree that it would become valuable to explore group process questions such as: What is “special” about memory in long-term couples or partners (Dixon, 2013) and what happens to shared or collective memories when a spouse dies (Hirst, 2013), or when people are thrust into other situations where they lose a long-time partner to dementia (Association for Psychological Science, 2011) or lose the social network where they share daily experiences, such as when people retire? Clearly, such examinations are important to explore as the basic research needed to support them develops sufficiently, and these will add to our

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four-step approach toward bridging theoretical and applied collaborative memory research in the future.

Some of our commentary writers (Barnier et al., 2013; Dahlström, 2013; Dixon, 2013) point out that the effects of collaboration on different forms of memory (e.g. implicit memory, semantic and episodic memory) and cognitive functions (e.g. decision-making) should be more strongly considered in our four-step approach. We agree entirely that such a comprehensive task approach will ultimately be beneficial toward not only increasing our basic understanding but it has applied value as well – for instance, as older adults in their everyday lives collaborate with others to remember personal experiences, names, facts, and locations. However, basic laboratory research to date on collaborative memory has focused more heavily on episodic memory (e.g. words lists, shopping lists, stories), though in our review we do touch on some of the creative research on collaborative remembering looking at memory for pre-existing semantic or autobiographical information (Andersson & Ronnberg, 1996; Harris, Keil, Sutton, Barnier, & McIlwain, 2011; Weldon, 2001). As basic research on the impact of collaboration across different tasks and materials in the areas of memory, problem solving, and decision making continues to grow, the field will be in a better position to systematically note similarities and differences across such processes and across different forms of memory in both basic and applied settings. In this regard, we especially appreciated Dixon's commentary in which he discusses complementary research from the developmental aging science field.

One of our commentary writers (Wright, 2013) suggested that we also consider simulated or computational approaches to studying collaboration. Such an approach may be particularly useful for developing and testing more specific theories or models of how collaborative memory processes work and influence later individual memory. This recommendation may be especially productive in circumstances where experimental work is not feasible and where simulated approaches are tightly constrained by extant empirical findings. Some promising examples have already started to emerge with agent-based computational simulations that examine how memory propagates in large social networks (Coman, Kolling, Lewis, & Hirst, 2012; Luhmann & Rajaram, in press). The situations where computational approaches would particularly illuminate the applied value of collaboration in aging remain to be tested and constitute intriguing considerations for future research.

Another idea put forth by one of our commentary writers (Barnier et al., 2013) is that the field as a whole is not ready to bridge the gap between laboratory-based and applied collaborative memory research. This concern particularly applies to those areas of inquiry within collaborative memory research we noted earlier where the basic research findings are still in infancy. Indeed, we agree there remain many unanswered questions regarding collaborative remembering in the laboratory (particularly in aging populations). But the extant data are strong enough for the particular focus of our proposed roadmap – the post-collaborative benefits on individual memory – to begin the study of collaborative remembering in applied settings. Although there are only a few laboratory studies on older adults, the findings show post-collaborative benefits in recall (Blumen & Stern, 2011; Henkel & Rajaram, 2011). Further, numerous laboratory studies have observed collaboration benefits on later individual recall in younger adults (Basden, Basden, & Henry, 2000; Blumen & Rajaram, 2008; Blumen & Stern, 2011; Congleton & Rajaram, 2011; Henkel & Rajaram, 2011; Weldon & Bellinger, 1997). In addition, a large body of epidemiological evidence tells us that socially active individuals are more resistant to age-related cognitive decline in general (James, Wilson, Barnes, & Bennett, 2011), and memory decline in particular (Ertel, Glymour, & Berkman, 2008). Furthermore, the costs of participating in a collaborative memory intervention (in contrast to a drug

trial) are at most the company of others. So, if we already know that collaborating with others can improve later individual memory in laboratory settings and that socially active individuals are more resistant to age-related memory decline, the time seems ripe to systematically explore applied studies and real-world interventions. Such an action-oriented approach that integrates findings obtained in the laboratory and applied settings through iterative testing across these settings has the potential to provide increasingly more targeted interventions to improve memory in aging. We stress the importance of an interdisciplinary approach in this regard: When research psychologists work closely with health care providers, social workers, gerontologists, and clinicians – all bringing their respective expertise, skills, and insights to the table – we see the potential for significant progress in science.

A related idea put forth by some of our commentary writers (Barnier et al., 2013; Dahlström, 2013) is that the field as a whole is not ready to begin examining the neural systems associated with collaborative remembering in aging. As discussed in our target review, there are both cautions and limitations to heed in this approach. We believe, however, that understanding the neural systems that operate during collaborative recall is particularly important in aging and clinical populations, and more generally for determining if the development of interventions that involves collaboration is a worthwhile endeavor. In other words, it is important to determine if the neural systems associated with collaboration are particularly affected or particularly spared in aging and clinical populations, such as people with amnesic symptoms or mild to severe cognitive impairment, in order to develop increasingly more targeted interventions that involve collaboration to improve memory in aging. Such an endeavor is not counter to mapping circumstances where, as Hirst aptly noted, “the poor memory performance of the elderly has its origin not in their neurological decay, but in the disruption of the social fabric of their lives” (p. 4, Hirst, 2013); rather, a study to identify the neural underpinnings associated with collaboration has the potential to inform who is more or less likely to benefit from collaboration. As discussed in our target review and alluded to in Dahlström's commentary, a study of the neural systems that operate during collaboration necessitates careful multi-modal approaches and designs where the neural systems of *perceived collaboration*, examined with functional Magnetic Resonance Imaging, are compared to the neural systems that operate during *actual collaboration*, which can be examined with functional Near Infrared Spectroscopy.

In sum, we recommend an action-oriented approach that builds on robust basic research and harnesses methods across different levels, disciplines, populations, and settings to inform how collaboration may be leveraged to enhance memory functions in aging. This action-oriented approach has the potential to develop not only increasingly more targeted interventions for improving memory with collaboration in aging, but also more specific theories of collaborative memory in aging.

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