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Rethinking the distinction between episodic and semantic memory: Insights from the past, present, and future

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Abstract
On the 50th anniversary of Tulving's introduction of the celebrated distinction between episodic and semantic memory, it seems more than fitting to revisit his proposal in light of recent conceptual and methodological advances in the field. This Special Issue of *Memory & Cognition* brings together researchers doing cutting-edge work at the intersection between episodic and semantic memory to showcase studies directly probing this psychological distinction, as well as articles that seek to provide conceptual and theoretical accounts to understand their interaction. The 14 articles presented here highlight the need to critically examine the way in which we conceptualize not only the relationship between episodic and semantic memory, but also the interplay between declarative and non-declarative memory, and the myriad implications of such conceptual changes. In many ways, we suggest this Special Issue might serve as a call to action for our field, inspiring future work to challenge pre-existing conceptions and stimulate new directions in this fast-moving field.

Keywords Episodic memory · Semantic memory · Declarative memory

Introduction

Few theories in declarative memory research have proven as influential, or stimulated as much empirical research, as Endel Tulving's episodic-semantic distinction. First introduced in 1972, Tulving proposed that human memory could be fractionated into two largely contrastive systems, whereby the experiences captured by episodic memory could be delineated cleanly from the generalised knowledge supported by semantic memory. For example, one's recollection of that first cool sip of water having completed the London Marathon in 2016 is eminently different from knowing that the molecular composition of water is H_2O, with both forms of memory posited to draw upon distinct computational processes. Originally, Tulving referred to this distinction as "an orienting attitude or a pretheoretical position" (Tulving, 1972, p.384), but it did not stay that way for long. Although he acknowledged that there were several processes likely common between episodic and semantic memory – for example, both selectively receive and retain information from perceptual systems and can transmit information to other systems – he stressed that there were enough differences to think of them as being distinct. For Tulving, the nature of the information and/or representational format the systems operated upon were fundamentally different; episodic memories were viewed as supported via spatio-temporal relations while information in semantic memory was mediated through conceptual, meaning-based associations. Moreover, Tulving envisaged key differences in the computational processing performed upon these representations (for a recent review, see Renoult & Rugg, 2020).

Although not without criticism (e.g., McKoon et al., 1986), in the decade that followed Tulving's, 1972 paper the episodic-semantic distinction gained immense popularity, providing a parsimonious framework for subsequent studies on memory. By the time he published his opus *Elements of Episodic Memory* in 1983, Tulving's initial paper had been cited over 500 times – quite a feat for pre-internet scholarship. On the surface, the available empirical evidence appeared to support a dissociation between the two kinds of

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memory, supporting a conceptual distinction that had been made by philosophers many centuries prior (e.g., Augustine, 1961). The framework rapidly pervaded the disciplines of cognitive psychology, clinical neuropsychology, and cognitive neuroscience research on memory. Evidence from clinical populations further bolstered the dichotomy between episodic and semantic memory systems, with studies in Alzheimer's disease, hippocampal amnesia, and Korsakoff's syndrome demonstrating robust dissociations. An update of the theory in 1985 saw Tulving introduce the phenomenology of memory into the discourse – episodic memory being largely defined in terms of *autonoetic* (self-knowing) consciousness while semantic memory was accompanied by *noetic* (knowing) consciousness (Tulving, 1985). As of today, the episodic/semantic distinction has been referenced many thousands of times and is firmly embedded in contemporary theories of memory and cognition.

Yet, as with all theories, the episodic-semantic distinction has had its stumbling blocks. In what should have been a much more well-known paper, McKoon et al. (1986) published a series of careful and detailed criticisms of the very results Tulving originally used as experimental support of a distinction between episodic and semantic memory. They argued that Tulving's interpretation of the neuropsychological data on individuals with amnesia was flawed and that, if anything, parallel deficits in semantic and episodic memory exist in such patients (e.g., Zola-Morgan et al., 1983). Indeed, McKoon et al. (1986) mention several existing studies, not discussed by Tulving, that provided empirical evidence against a strict fractionation between episodic and semantic memory. A larger set of critiques was presented in the open peer commentary for Tulving's précis of his 1983 book on episodic memory (Tulving, 1984) with some prominent memory researchers offering little support in favour of the distinction (Baddeley, 1984; Lachman & Naus, 1984; Morton & Bekerian, 1984; Roediger, 1984; Tiberghien, 1984) beyond its basic intuitive appeal (Kihlstrom, 1984). Despite these challenges, the episodic-semantic distinction has come to be a mainstay of our basic conceptions of declarative memory.

Importantly, and as will become evident in this Special Issue, a number of critical questions remain regarding the positioning of episodic and semantic memory as two mutually exclusive systems, with little to no crosstalk. In the past two decades, emerging findings have called into question the nature of this distinction with the suggestion that episodic and semantic memory may interact far more than previously assumed (Irish, 2020; Lane et al., 2015; Renoult et al., 2019; Rubin & Umanath, 2015). The picture that has emerged is that memories do not fall neatly or independently into one system or the other. Attempts to parse declarative memory into an episodic system for events and a semantic system for knowledge imply that different information is stored in each. While this criterion holds for the controlled lab-based learning of a list of items, the segmentation of episodic and semantic information for real-world narratives is decidedly problematic (e.g., Strikwerda-Brown et al., 2019). Functional neuroimaging evidence further suggests considerable overlap in terms of the brain regions that support episodic and semantic retrieval (Binder et al., 2009; Rugg & Vilberg, 2013), while neuropsychological studies of clinical populations converge to reveal increasingly blurred lines between episodic and semantic encoding and retrieval (reviewed by Greenberg & Verfaellie, 2010). Moreover, it seems that autonoetic consciousness may not be a prerequisite for the recollection of personal episodes from the past (Klein, 2013). Finally, the recent paradigmatic shift to consider episodic memory as the foundation for future-oriented and counterfactual forms of thinking brings with it further evidence of the interdependencies between episodic and semantic processes (De Brigard & Parikh, 2019; Irish et al., 2012). It may be that much of what we have accepted about the organisation of declarative memory warrants revision.

The Current Special Issue

On the 50th anniversary of Tulving's theory, it seems more than fitting to revisit the episodic-semantic distinction in light of recent conceptual and methodological advances in the field. The purpose of this Special Issue of *Memory & Cognition* is to bring together researchers doing cutting-edge work at the intersection between episodic and semantic memory to showcase studies directly probing this psychological distinction, as well as articles that seek to provide conceptual and theoretical accounts to understand their interplay. We hope that this Special Issue will help to establish a new foundation to rethink a distinction that, to this day, has proven so central to our understanding of declarative memory.

First, *Rubin* provides a new theoretical proposal that eschews the traditional hierarchical structure of memory, by mapping memory as a whole within a conceptual space. Three dimensions are proposed comprising implicit versus explicit, self-reference, and (mental) scene construction, drawing upon appropriate findings from the behavioural and neuroimaging literature. As such, Rubin provides a novel framework for future empirical research to delineate the permutations and associations between each of these putative memory dimensions.

Rather than focusing on the separation of memory types, *Hovhannisyan et al.* systematically explore episodic-semantic interactions with a novel large-scale set of images of objects, carefully normed along visual and semantic attributes. In addition to making these useful stimuli openly available for use, they demonstrate how certain complex visual and semantic attributes of the stimuli, as identified by a deep

convolutional neural network, are predictive of memorability in subsequent visual and lexical memory tests. This work is important for identifying memories that exist in the liminal space between what might be considered wholly episodic or semantic.

In a similar vein, *Cohn-Sheehy et al.* report the results of three experiments that converge to suggest that coherent narratives help to bridge information across separate event boundaries. These studies strongly suggest that the kinds of higher-order associations known to scaffold episodic information go beyond simple conceptual and semantic associations, and rather provide a higher-order complex structure within which episodic information can be remembered.

Next *Coane et al.* tackle memories for real-world events that were acquired in an informal manner, drawing on recent work addressing the face validity of the Remember/Know paradigm, which was originally used to assess episodic and semantic recall, respectively. The authors demonstrate that the terms *remember* and *know* can be effectively used to capture the mixed event and knowledge-based phenomenological features of memories for recent, informally acquired events. This work provides a step towards examining how new information may be stored and maintained with both episodic and semantic qualities rather than in separate systems.

O'Neill et al. explore the issue of how previously acquired semantic information influences episodic encoding and retrieval. The authors investigate how differences in category learning strategies potentially influence classification accuracy as well as potential downstream effects on recognition memory of category-consistent items as well as category-consistent lures. Across two experiments they show that acquiring knowledge of unidimensional rule-based categories increases hit and false alarm rates for category-consistent items, regardless of whether the category was learned with or without explicit instruction or with or without supervision. Reaction times during recognition, however, show a slight advantage for both explicit and supervised category learning, suggesting that these strategies offer processing speed advantages in recognition memory above and beyond classification accuracy.

In a related vein, *McNeely-White et al.* tackle the question of how semantic knowledge acquired prior to the experimental session might influence the familiarity signal in episodic recognition. Using a variation of a semantic-feature-based recognition-without-recall list-learning paradigm, the authors leverage the computational resources of the MINERVA 2 model. They provide an elegant simulation of different degrees of existing semantic knowledge into the baseline familiarity levels for each studied item and determine how subsequent recognition can be influenced using a signal-detection theoretical framework. As such, this article offers a convincing model of the semantic-feature-based-recognition-without-recall phenomenon as well as a fruitful avenue to model prior semantic knowledge in recognition memory paradigms.

The role of context and how it interacts with the way in which episodic and semantic memories are stored and retrieved is examined by *Davis et al.* The authors explore memory for episodic contexts – that is, specific spatiotemporal or perceptual information that has no bearing on the meaning of the central stimulus – and show that, in some cases, episodic contexts are less well remembered when paired with abstract as opposed to concrete concepts. Likewise, they show that abstract concepts are less well remembered when the episodic contexts in which they were encoded are retained at retrieval, suggesting that arbitrary episodic context may be inhibited. These findings of a complex interplay between context and target items raise intriguing implications for the episodic and semantic distinction.

Clinical investigations of memory are further essential to understand how episodic and semantic processes potentially intersect. *Tanguay et al.* explore how retrieval of personal semantics (i.e., self-defining conceptual information) is affected in older adults, and whether the neural correlates of self-knowledge might be less distinct from those of episodic and semantic memory. Using a novel ERP (event-related potential) paradigm, the authors demonstrate that the amplitude of the LPC (late positive component) (implicated with episodic recollection) differentiated self-knowledge, general semantic, and episodic retrieval conditions in young adults but this effect was not observed in older adults. These findings suggest that episodic and semantic memory become less distinct in ageing but likely relate to individual differences in episodic memory function.

Similarly, *Pitts et al.* explore how semantic knowledge influences the acquisition of new episodic memories in ageing via an event segmentation encoding mechanism. Across three studies, older and younger adults were required to segment and remember videos of everyday activities that were either familiar or unfamiliar to their age group. Older adults showed poorer performance only on trials with unfamiliar videos. In contrast, when video content was familiar to older adults, and therefore provided the appropriate semantic knowledge, older adults showed no such age-related deficits. These findings offer important insights into how episodic encoding and retrieval might be augmented in healthy ageing by harnessing semantic knowledge.

Building on these insights, *Whatley and Castel* explore the role of metacognition on memory accuracy for both schema-consistent and schema-inconsistent items (i.e., grocery items that were either appropriately priced or overpriced) in healthy ageing. Across two experiments they found that younger and older adults employed similar metacognitive control strategies, insofar as they both tended to allocate more study time to schema-inconsistent relative

to schema-consistent items. Likewise, both groups judged schema-inconsistent items to be less likely to be remembered, although, interestingly, age differences emerged in confidence ratings for both studies. Taken together, their results suggest the intersection between episodic and semantic memory at the level of phenomenology across the lifespan.

Embracing recent advances in our understanding of future simulation, *Jeunehomme and D'Argembeau* explore the interplay between episodic and semantic memory for so-called 'memories of the future'. Across two studies, the authors found that the encoded memories of such simulations are better recalled when they are self-referential or related to personal goals and, therefore, integrated within a person's existing autobiographical knowledge structures. This work provides nuanced evidence of the important interplay between what might be considered episodic and semantic; that is, that knowledge structures can and do enhance memories of events.

The representational content of future simulations is explored by *Strikwerda-Brown et al.* in the disease syndromes of semantic dementia and Alzheimer's disease. Using a novel scoring protocol, the authors demonstrate that the 'external' or non-central details generated by patients reflect an amalgam of episodic and semantic content, which varies in terms of specificity and self-relevance. Interestingly, the provision of external details in semantic dementia was associated with integrity of posterior parietal brain regions typically implicated in episodic retrieval, suggesting a compensatory process by which episodic memory might be co-opted when semantic knowledge is compromised.

Extending these observations, *Jansen et al.* explore how episodic and semantic forms of future thinking are affected in Korsakoff's syndrome, a densely amnesic neuropsychiatric disorder. Relative to healthy controls, Korsakoff patients showed profound impairments across all forms of past and future thinking. These deficits were also observed on a novel event-simulation task requiring participants to envisage an implausible event (spending a day on the moon). Correlation analyses revealed significant associations between reduced episodic detail on the moon task and episodic and semantic future thinking deficits in the Korsakoff's group that cannot be fully understood in terms of a strict episodic-semantic dichotomy.

Finally, embracing the fact that much of the content of memory can arise spontaneously or unbidden, *Jordao and St. Jacques* offer a novel theoretical review of episodic-semantic interactions in non-deliberate or spontaneous forms of cognition. Invoking evidence from semantic priming and the representational content of spontaneous thought, along with lesion evidence primarily from the syndrome of semantic dementia, the authors propose that episodic and semantic memory are strongly intertwined during spontaneous cognition but with episodic memory perhaps playing a more central role in this process. Spontaneous cognition is proposed as a new and richly informative approach to understand the functional independence and overlap between these memory systems.

Future directions

Far from being the last word on the relationship between episodic and semantic memory, we view this collection of articles as laying the essential groundwork for future research on this topic. The 14 articles presented here highlight the need to critically examine the way in which we conceptualize not only the relationship between episodic and semantic memory, but also the interplay between declarative and non-declarative memory, and the myriad implications of such conceptual changes. In many ways, we suggest this Special Issue might serve as a call to action for our field, inspiring future work to challenge pre-existing conceptions and stimulate new directions in this fast-moving field.

One fruitful avenue for future research concerns the incomplete understanding of how episodic and semantic representations are acquired, refined and continue to evolve across the lifespan. Lifespan approaches will be central to understanding the variety of ways in which episodic and semantic information diverge and intersect from infancy to older age.

The question of individual differences in processes that are posited to support memory function also becomes crucial to consider. In this vein, individuals with varying capacities for visual and mental imagery may offer unprecedented insights into the interdependencies between these systems across a continuum of performance (Conti & Irish, 2021; Zeman et al., 2020). As noted by many of the articles in this Special Issue, the capacity to remember past episodes, and to simulate future events, is not independent of our categorical, conceptual and general knowledge. Understanding how individual differences in terms of prior knowledge and semantic memory interact with variability in episodic recollection is another area ripe for investigation.

Some of the articles in the current collection also help to shed light on the ways in which remembered episodes are structured and organized in memory. A key theme to emerge is the role of narratives in scaffolding our episodic memories, resonating with a growing body of work in the cognitive neuroscience literature (Lee et al., 2020). The mechanisms by which narratives are structured and their role in organising memory retrieval remains unclear. The representational format of narratives further warrants consideration; do narratives necessarily involve language or might they take different forms depending on the encoding and retrieval context? (see, e.g., Christensen et al., 2019). More broadly, how do cultural differences in how we acquire and

deploy narratives inform episodic-semantic interdependencies across different contexts?

Finally, the current issue provides some new insights into the neural architecture of episodic and semantic memory resonating with current models that emphasise the contribution of large-scale brain networks rather than single regions operating in isolation. As increasingly sophisticated neuroimaging techniques become available, we stand to gain further clarity on how the role of macro-scale cortical gradients might support the convergence of episodic and semantic representations depending on the specificity and content of memory traces (Irish & Vatansever, 2020). Clarifying the shared neural substrates of episodic and semantic representations promises to further inform the biological basis of memory disturbances in clinical disorders as well as inform treatment approaches by which existing information can be exploited.

With these questions in mind, we invite readers of this Special Issue to reflect on how we as a field might approach the characterisation of different kinds of memory. As the field continues to evolve, new taxonomies and measurement approaches will almost certainly be required (De Brigard, 2020). How exactly we might achieve consensus remains a fundamental challenge for our field, but one that we encourage the readership of *Memory & Cognition* to embrace.

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