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RESEARCH REPORT

Familiarity and Personal Experience as Mediators of Recall When Planning for Future Contingencies

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In this article, we demonstrate that planning tasks enhance recall when the context of planning (a) is self-referential and (b) draws on familiar scenarios represented in episodic memory. Specifically, we show that when planning tasks are sorted according to the degree to which they evoke memories of personally familiar scenarios (e.g., planning a picnic), recall is reliably superior to tasks that fail to do so (e.g., planning an Arctic trek). We discuss the implications of these findings for planning tasks and their relation to episodic memory.

Keywords: memory, planning, future, time, evolution

In a recent series of studies, we have made the case that one function of memory, from an evolutionary standpoint, is inherently prospective: Its adaptive function is to store information that can be used to support future judgments and decisions that cannot be know in advance with certainty (e.g., Klein, Cosmides, Tooby, & Chance, 2002; Klein, Robertson, & Delton, 2010, 2011). Accordingly, all animals with neural systems sufficiently complex to enable long-term memory are necessarily oriented toward the "now and the next."

What separates humans from our closest evolutionary relatives is not planning, per se, but the extent and complexity with which we are able to plan future contingencies, that is, imagine our actions and their consequences (e.g., Brandimonte, Einstein, & McDaniel, 1996; Cosmides & Tooby, 1987; Donald, 1991; Klein et al., 2010, 2011; Passingham, 1982). Although all organisms capable of long-term memory are of necessity oriented toward the future, what is unique to human long-term memory is the extent to which our plans entail complex, flexible, and temporally extensive responses to the environment (e.g., Donald, 1991; Lombardo, 2008; Klein et al., 2010; Suddendorf & Corballis, 1997).

By virtue of this sophistication, humans, unlike most other mammals, can anticipate and plan for personal future contingencies (e.g., Klein, Loftus, & Kihlstrom, 2002) that transcend their immediate needs—for example, planning that is not a species-typical fixed action pattern and is not tied directly to current motivational states (e.g., Bischof-Koehler, 1985; Suddendorf & Corballis, 1997). Such versatility confers an enormous selective advantage on human planning ability (e.g., Klein et al., 2010, 2011; Lombardo, 2008).

We previously offered support for the special relation between memory and planning by showing that evaluating a list of words with a mindset of planning for an event (future oriented processing) promotes better recall of those items than does encoding the same items in the context of episodic recollection of the same type of event (past oriented processing) or judging the items' relevance to that type of event without regard to either the past or the future (atemporal processing condition; in this study, the event was always a camping trip; see Klein et al., 2010, for details). We hypothesized that of the three experimental conditions, planning processing would yield superior recall because systems of memory have been designed by evolution to interface with systems for long-term planning. For an organism to behave more adaptively at a later time as a result of experiences at an earlier time, that organism needs to be equipped not only with neural mechanisms that retrieve ontogenetically acquired information but also with mechanisms that use this information to make decisions in the service of planning for future contingencies. Because one of the most important adaptive functions of human memory is to monitor, store, and subsequently access information in the service of planning, memory, when thus engaged, should evidence a performance that is particularly efficient (this argument draws heavily on the distinction between a system's capabilities and its functions: e.g., Klein et al., 2009; Klein, Cosmides, et al., 2002).

A second set of studies (Klein et al., 2011) offered additional evidence in support of these ideas. This study compared planning to another proposed evolutionary function of memory—survival related processing (e.g., Nairne & Pandeirada, 2011; Nairne, Pandeirada, Gregory, & Van Arsdall, 2009; Nairne, Pandeirada, & Thompson, 2008; Nairne, Thompson, & Pandeirada, 2007). Our results demonstrated that although survival processing is a very

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effective encoding strategy, it may have the unintended consequence of confounding survival processing with planning processing (the latter, we contend, is more conceptually primitive and thus more amenable to design via natural selection; for discussion, see Klein et al., 2010).

To examine this conjecture, we designed a series of studies that varied the amount of survival and planning processing engendered by a series of tasks. The results demonstrated that a planning task with few if any implications for personal survival (e.g., planning a dinner party) yielded recall that was statistically indistinguishable from a task that promoted survival processing of the same stimuli. In a follow-up study, we compared a survival task that entailed minimal planning with a survival task that promoted high levels of planning. The results revealed that survival, absent its planning component, produced recall statistically inferior to that produced by survival conjoined with planning. Thus, survival and planning, although contingently related, are not logically bound. When separation between these two components is achieved, planning processing can equal survival processing.

Planning as an Evolved Component of Memorial Processing

Our purpose in the present article is not to reengage in the debate over whether survival processing is a superior recall strategy. There is a rapidly growing literature on this topic (e.g., Burns, Hwang, & Burns, 2011; Butler, Kang, & Roediger, 2009; Kang, McDermott, & Cohen, 2008; Klein et al., 2011; Nairne, 2005; Nairne & Pandeirada, 2011; Weinstein, Bugg, & Roediger, 2008), and we do not wish to enter this debate beyond what we already have contributed. Rather, our goal is to focus specifically on the role of planning as a memorial aide.

The Problem With Planning

If one accepts our arguments about planning and its memorial potency, however, one is confronted by a puzzling result: Tasks that entail planning have often been used as control tasks in studies demonstrating the superior recall associated with survival processing. Consistent with Nairne and colleagues' proposal about the evolutionary memorial advantage of survival encoding, researchers typically find planning tasks yield recall performance inferior to survival tasks (e.g., Kang, McDermott, & Cohen, 2008; Nairne et al., 2009; Nairne et al., 2008; Nairne et al., 2007; Weinstein, Bugg, & Roediger, 2008; for conflicting findings, see Butler, Kang, & Roediger, 2009; Klein et al., 2010; Klein, 2011). These results appear to weaken our arguments about the memorial potency of planning and its potential role in the survival processing memory advantage.

The planning and survival tasks in most studies, however, differ along multiple dimensions, including, but not limited to, the context of encoding (e.g., survival on the savannah versus planning an extended vacation or a move to a foreign country) and the personal familiarity of the planning scenario (planning a bank robbery, planning to go on a hunting trip, planning an extended stay in a luxury hotel, planning a move to a new home in a foreign land, evading an assassin in a strange city; see, e.g., Klein et al., 2010). Accordingly, participants were likely to have few, if any, personally relevant experiences regarding the *type* of planning encouraged by the control tasks performed—for example, moving to a foreign land, fighting attackers in the streets of a strange country, robbing a bank, or going on a hunting trip on the savannah. Such tasks often appear to lack a personal, real-world relevance that connects performance in a meaningful way to participants' actual experience; what Klein, Loftus, and Kihlstrom (2002) labeled *lived time*.

Lived time is personal, self-referential, and based largely on episodic memory (see also Tulving, 2002). When it is future-oriented, lived temporality recruits self-referential episodic recollections, which now are well-known to serve as the foundation for imagined scenarios involving the self (e.g., Atance, & O'Neill, 2005; Buckner & Carroll, 2007; Klein, Loftus, & Kihlstrom, 2002; Schacter, Addis,& Buckner, 2008; Suddendorf & Corballis, 1997, 2007; Szpunar & McDermott, 2008; Wheeler, Stuss, & Tulving, 1997). Thus, a connection with lived time may be important to the future-oriented function of memory for constructing personally relevant scenarios (for discussion, see Klein et al., 2010, 2011; Suddendorf & Corballis, 2007). Given these consideration, our previous studies used planning tasks (e.g., a camping trip, a dinner party) for which participants' reported considerable personal experience.

It is our contention that this aspect of planning—the ability to recruit episodic personal recollections pertaining to the planning scenario—is fundamental to planning a personal future (e.g., Atance, & O'Neill, 2005; Klein, Loftus, & Kihlstom, 2002; Suddendorf & Corballis, 2007; Tulving, 1985) and is thus necessary for the superior recall found in the planning scenarios we have used (Klein et al., 2010, 2011). By contrast, planning scenarios serving as control encoding tasks in other studies of survival processing typically do not reflect lived situations of planning in participants' real-world experience (and hence are likely to lack personally relevant representation in episodic memory). Such scenarios are thus unlikely to draw on personal recollections—a form of memory that repeatedly has been shown to enable its owner to plan future actions and anticipate future events (e.g., Klein, Loftus, & Kihlstrom, 2002; Schacter, Addis, & Buckner, 2008; Suddendorf & Corballis, 2007; Szpunar & McDermott, 2008; Tulving & Lepage, 2000; Wheeler, Stuss, & Tulving, 1997).

The Present Study

In the present study, we selected four encoding conditions, all of which involved planning. They differed, however, in the degree to which the planning scenario was one for which the participants had personal experience: Half the tasks were ones for which most participants had self-relevant personal experience, and half consisted in planning for something that few if any participants could reasonably be expected to have first person familiarity. Our intuitions about the personal relevance of the individual planning scenarios were substantiated by pretesting and, more important for present purposes, a set of manipulation checks for each of the four planning scenarios. Manipulation checks also revealed that as expected, all four scenarios entailed approximately equal degrees

of planning on the part of participants but varied in the degree to which they engendered thoughts of personal survival.[1]

To summarize, we predicted that planning tasks that engage episodic recollections of personally relevant experiences would promote better recall of stimulus items than would planning that lacked familiarity and that could not thus draw on personal representations of the encoding context in episodic memory. These results should be independent of the amount of survival processing engendered by an individual task.

Method

Participants

One hundred twenty undergraduates in an introductory psychology class participated in the study. The experiment was conducted in a single, mass-testing session lasting approximately 25 min.

Materials

Participants were randomly assigned to one of four encoding conditions ($N = 30$ per condition). The two high personal relevance conditions were as follow:

1. The dinner party planning condition, in which participants were told,

> Imagine you are planning a dinner party for the weekend. You plan to go to the store to purchase food. Since you are not sure of the guests' food preferences, you plan on purchasing a variety of different foods. Below you will find a list of items. I would like you to rate how likely it is that each of the items on the list is a product you might consider when planning for your party. For some items, it may be very likely that you will select them. For others, it may be unlikely. It is up to you to decide.

2. The picnic planning condition, in which participants were told,

> Imagine you are making plans to take a picnic. What food items would you plan to take with you? Below you will find a list of items. I would like you to rate how likely it is that each of the items on the list is something you might consider when planning for your picnic. For some items, it may be very likely that you will select them. For others, it may be unlikely. It is up to you to decide.

The two low personal relevance conditions were as follows:

1. The zoo meal planning condition, in which participants were told,

> Imagine you are planning to go to the store purchase food to make meals for animals at a local zoo. Since you are not sure of the animals' food preferences, you plan on purchasing a variety of different foods. Below you will find a list of items. I would like you to rate how likely it is that each of the items on the list is a product you might consider when planning for your food purchase. For some items, it may be very likely that you will select them. For others, it may be unlikely. It is up to you to decide.

2. The Arctic planning condition, in which participants were told,

> Imagine you are making plans to take a trip to Antarctica. What food items would you plan to take with you? Below you will find a list of items. I would like you to rate how likely it is that each of the items on the list is something you might consider when planning for your Arctic trip. For some items, it may be very likely that you will select them. For others, it may be unlikely. It is up to *you to decide.*

In pretesting with a separate sample of participants ($N = 48$), we asked participants to decide whether they had personal experience with each of our four scenarios: dinner party planning, picnic planning, zoo meal planning and planning an Arctic trek. We randomly paired 12 participants with each judgment scenario. Their options were yes and no.

The findings revealed that participants were highly likely to report personal experience with the dinner and picnic scenarios (Ms = 92% and 83%, respectively). By contrast, personal experience for planning zoo meals and Arctic treks was essentially absent (Ms = 0.08% and 0.00%, respectively). These findings served as the basis for labeling the dinner party and picnic planning groups our "high personal experience" conditions and the zoo meal and Arctic trek groups our "low personal experience" conditions (this pattern of personal experience was additionally confirmed by subsequent manipulation checks—see the Results section of this article).

All participants viewed the same list of 30 stimulus words. The words all represented small, movable, potentially edible objects (e.g., sugar, carrots, glue, kerosene) that had previously been tested and found relevant to food-related planning decisions (see Klein et al., 2011, for documentation of the relevance of the to-be-remembered items to food-relevant planning decisions).[2] Half the participants in each experimental condition were randomly assigned to receive one of two random orderings of the list words.

Design and Procedure

At the start of the study, each participant received a booklet containing the experimental material appropriate to his or her condition. Participants were instructed to remain on the page on which they were currently working and to not turn from that page until explicitly requested to do so (the word "stop" was prominently displayed at the bottom-center of each booklet page). Participants also were instructed not to refer back to a previous page in the booklet once work on that page had been completed. To ensure compliance, six research assistants monitored participant performance. There were no reports of any participants who failed to comply with these instructions.

The first page of the booklet contained instructions describing the encoding task they would perform (see above). Below the task instructions were the 30 list words, printed one per line. Each word

[1] To bring our experimental conditions into conformity with factors previously found to make a difference in recall performance with planning and survival processing, the scenarios used were equated with regard to the difficulty of their performance (e.g., Klein et al., 2011) and the relevance of the to-be-remembered items to each of the four planning scenarios (e.g., Butler et al., 2009). For data and discussion, see Klein et al., 2011.

[2] Although we used edible–nonedible items as stimuli in the present study, it should be noted that we have used several different stimulus types (e.g., items with differing relevance to camping) in previous studies and achieved comparable results with the planning task (Klein et al., 2010, 2011).

was accompanied by a 5-point scale that ranged from 1 = *very likely* to 5 = *very unlikely*. Four minutes were allotted to complete this portion of the study (pretesting indicated this interval was sufficient for participants to read instructions and make ratings at a comfortable pace; see Klein et al., 2011, for discussion).

Following the rating/encoding task, participants were instructed to turn to page 2, which asked them to "Please use the scale below to indicate how hard you found the rating task. Circle the most appropriate scale value." The scale ranged from 1 = *very hard* to 5 = *very easy*. Thirty seconds were provided to perform this rating.

The next page contained a series of anagram completions and served as a 3 min distracter task. Participants were asked to complete as many anagrams as they could in the time provided.

Participants then were asked to continue to page 4, which contained instructions for the recall portion of the study. The instructions read,

> We now would like you to try to recall the words you rated in the first part of the study. Please write the words, one per line, in the spaces provided below. You may recall the words in any order they come to mind.

The page contained 30 blank lines. Four minutes were provided for recall.

On completion of recall, participants were instructed to turn to the final page of the booklet. This page contained questions designed as manipulation checks on our assumptions about the personal relevance of each planning scenario, the extent to which participants had survival-relevant thoughts when rating stimulus items for task-relevance, the extent to which stimulus ratings evoked thoughts of planning, and the degree to which self-relevant thoughts occurred during performance of the assigned rating task.

Specifically, participants were asked,

> Please use the scale below to indicate whether the ratings about the relevance of the list of words to scenario XXX [where "scenario XXX" is shorthand for the rating task completed in the initial phase the study; e.g., judgments about the suitability of stimulus words for planning dinner parties, Arctic treks, etc.] were based **on personal experience** with XXX. Circle the most appropriate answer.

Their choices were simply yes and no. They also were asked, "On the rating scale provided below, please rate the extent to which thoughts of personal survival played a part in your judgments about rating the items you selected as relevant for XXX." The rating scale consisted in the following options: 1 = *not at all*, 2 = *somewhat*, 3 = *quite a bit*, and 4 = *always*. Another question pertained to the degree to which participants thought of themselves during task performance: "On the rating scale provided below, please rate the extent to which thoughts of yourself played a part in your judgments about rating the items you selected as relevant for your XXX." The same scale values used with survival ratings were served as judgment options. Finally, participants were instructed, "On the rating scale provided below, please rate the extent to which thoughts of planning played a part in your judgments about rating the items you selected as relevant for XXX." Scale values were identical to those used for survival ratings. The ordering of presentation of rating tasks was randomized across participants. Two minutes were allowed to complete the ratings, after which all the booklets were collected, and participants were debriefed.

Results

Out of the hundreds of items remembered, only three were extralist intrusions. Intrusions were not counted as part of a participant's recall score.

A one-way analysis of variance conducted on the mean recall scores yielded a reliable effect of tasks, $F(3, 119) = 2.79$, $p < .05$, $MSE = 7.19$. Consistent with predictions, participants in the dinner planning condition and the picnic planning condition recalled more words (Ms = 15.00 and 14.37, respectively) than did participants in the zoo planning condition and the Arctic trip condition (Ms = 13.35 and 13.24, respectively). On the basis of the analysis of participants' ratings of personal experience with our four planning scenarios (Ms = 90% and 77% for dinner and picnic planning, respectively, versus 0.00% and .04% for zoo meal planning and Arctic planning, respectively), we combined the four separate conditions into two groups each consisting of two of the four scenarios. This merging was based on participants' degree of personal experience with a particular planning scenario. As expected from pretesting, the dinner and picnic groups (high personal experience conditions; M personal experience = 83.50%), showed considerably greater levels of experience than did the zoo meal and Arctic trek groups (our low personal experience conditions; M personal experience = 0.02%), $t(59) = 15.92$, $p < .001$. By planned comparisons (Rosenthal & Rosnow, 1985), the high experience groups reliably recalled more items ($M = 14.63$ items) than did participants in the low experience groups ($M = 13.31$), $F(1, 116) = 6.87$, $p < .01$.

With additional manipulation checks, we examined participants' ratings of the extent to which they had thoughts of (a) planning and (b) survival while judging stimuli for task relevance. For the planning ratings, the dinner, picnic, zoo, and Arctic groups produced means of 3.30, 2.70, 2.53, and 3.07. A planned comparison conducted on these means with groupings based on personal experience (see above) revealed no reliable differences in thoughts of planning during task performance, $F(1, 119) = .04$, $p > .50$, *ns*. By contrast, planned comparisons on the prevalence of survival thoughts during task performance did produce a reliable difference in group means, $F(1, 116) = 5.01$, $p < .05$, $MSE = 0.74$: The combined dinner and picnic planning scenarios ($M = 1.27$) evidenced statistically fewer survival relevant thoughts then did the zoo and Arctic grouping ($M = 2.29$). Interestingly, this difference is primarily attributable to personal survival thoughts in the Arctic trek scenario ($M = 3.00$; the Ms for the dinner, picnic and zoo scenarios were 1.27, 1.27, and 1.53, respectively).[3]

[3] Note that although the Arctic trek scenario elicited the greatest number of survival thoughts, memory performance on this task was lower than for the dinner and picnic scenarios. Thus, these data do not offer clear support for survival processing, per se, as a memorial aide. (We note, however, that Nairne and colleagues have been very clear in arguing that for survival to yield high recall, the context in which survival takes place must be the African savannah; e.g., Nairne, 2005; Nairne & Pandeirada, 2011; Nairne et al., 2008. Accordingly, the absence of a clear effect of survival thought on recall in the present study was not unanticipated.)

Of course, it is possible that differences in recall might reflect, at least in part, differences in the difficulty of the rating task participants were asked to perform. A check of participants' ratings of task difficulty, however, provided no evidence for this potential confound. Rating ease judgments for our high experience tasks (*M*s = 4.67 and 4.47, for the dinner and picnic tasks, respectively) failed to differ reliably from rating ease judgments for the low experience task grouping (*M*s = 4.54 and 4.30, for zoo meal and Arctic trek, respectively; $F(3, 119) = 1.11$, ns, $MSE = 0.65$. Thus, participants found all four tasks comparable in ease of performance, with ratings varying between easy and very easy.

Discussion

The goal of the present research was to test one hypothesis for why tasks that require planning one's future activities have produced varying levels of recall performance. Possible sources of variation between planning conditions used in these studies include the planning context (e.g., survival in the wild, planning an extended vacation, planning a camping trip, or planning a move to a foreign country) and the plausibility/familiarity of the planning scenario (e.g., planning a bank robbery or planning to protect oneself from attackers in a strange city versus planning a dinner party), both of which affect whether the task can engage relevant memories of personal experience.

In addition to these methodological concerns, there also are theoretical considerations that merit attention. Of particular relevance to the present study is a distinction proposed by Klein, Loftus, and Kihlstrom (2002) between what these authors termed *lived time* and *known time*. *Lived time* is personal, self-referential, and based on episodic memory. When it is future-oriented, lived temporality recruits self-referential episodic recollections that serve as the basis for imagined personal scenarios (for related views, see Klein et al., 2010; Suddendorf & Corballis, 1997, 2007; Wheeler, Stuss, & Tulving, 1997). *Known time*, on the other hand, is a form of mental time travel associated with semantic memory that allows a person to orient to imagined future events *without* experiencing them as a future part of his or her personal history. Known time enables its owner to know about, but not reexperience, previous states of the world and to draw on this generic knowledge to construct *impersonal* scenarios for the future.

In this regard, planning a dinner party or a picnic (which 83.5% of our participants reported having personal experiences) differed markedly from the planning conditions entailing zoo meals and Arctic treks (tasks for which participants had few if any personally relevant experience). As predicted, these dramatic differences in personal experience mapped reliably onto differences in recall: "high experience" groups (dinner and picnic planning) produced reliably greater recall than did groups for whom personal experience/familiarity with the planning scenario was limited (zoo meal or Arctic trek planning).

The variable of personal experience also helps explain why planning scenarios in previous studies often yield inferior recall performance relative to comparison tasks (e.g., survival on the savannah).[4] Planning scenarios typically required participants to plan for events such as "assembling things one would need to rob a bank" or "planning a move to a foreign country"—all events outside the scope of most undergraduates' personal experience. For most participants, such scenarios lack personal, scenario-relevant experience. This would likely require participants to rely on *known time* to formulate his or her answers to questions of item relevance, drawing on generic knowledge rather than personal relevance.

Accordingly, the type of planning involved in the "high personal experience" groups of the present study (dinner and picnic planning) seem more likely than previously adopted planning tasks—which typically lack connection to participants' personal experience—to involve lived temporality. Similar considerations help explain the comparatively poor performance found for our zoo meal and Arctic trek planning scenarios (i.e., "low experience" groups), which lack a clear connection to *lived time*—a factor which, we believe, plays a crucial role in future-oriented functions of memory.

[4] Although the savannah scenario might seem remote from personal experience and thus not amenable to the "lived time" argument, it is important to note that participants almost invariably report that they imagined the savannah scenario by converting it to a personally familiar context (e.g., being in a field, walking on the prairie), thereby enhancing their personal familiarity with what otherwise might seem a foreign context. For details and data, see Klein et al., 2011.

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