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Do humans use episodic memory to solve a *What-Where-When* memory task?

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ABSTRACT –*What-Where-When* (WWW) memory tasks have been used to study episodic(-like) memory in non-human animals. In this study, we investigate whether humans use episodic memory to solve such a WWW memory task. Participants are assigned to one of two treatments, in which they hide different coin types (*what*) in different locations (*where*) on two separate occasions (*when*). In the Active treatment, which mimics the animal situation as closely as possible, participants are instructed to memorize the WWW information; in the Passive treatment, participants are unaware of the fact that memory will be tested. In both groups, the majority of participants report using a mental time travel strategy to solve the task, and performance on a different episodic memory test significantly predicts performance on the WWW memory task. This suggests that the WWW memory task is a good test of episodic memory in humans. Participants remember locations and coins from the first hiding session better than they do those of the second hiding session, suggesting their memories may be reinforced during the second hiding session. We also investigated how well episodic memory performance predicted performance on the three aspects of the WWW memory task separately. In the Passive treatment, episodic memory performance predicts performance on all three aspects of the WWW memory task equally. However, in the Active treatment it only predicts performance on the *what* component. This could imply that during active encoding a different memory system is used for *where* and *when* information than during passive encoding. Encoding of *what* information seems to rely on episodic memory processing in both conditions.

Keywords: What-where-when memory, episodic memory, episodic-like memory, active memorization, passive memorization, human participants, *Homo sapiens*

Episodic memory is the type of declarative memory we use to recall/re-experience specific events from our own personal history. Because the experience of episodic memory is explicitly tied in with (self-)consciousness, the question of whether non-human animals have episodic memory has been an active topic of debate in recent years (Crystal 2009). The first evidence to suggest that other animals might have a similar memory system came from a study in which Western Scrub Jays (*Aphelocoma californica*) were shown to remember which type of food they had hidden (*what*) in which location (*where*) and how long ago (*when*) (Clayton and Dickinson 1998). Remembering *what* happened, *where*, and *when* was part of the original definition of episodic memory in humans (Tulving 1972), and the performance on these tasks has therefore been termed "episodic-like" memory, because of the lack of evidence on the subjective experience of the animals. These findings have been further explored in a number of follow-up studies by the same group (e.g. Clayton et al. 2001; Clayton et al. 2003; de Kort et al. 2005), was recently replicated in two other food-hoarding species (the magpie *Pica pica* (Zinkivskay et al. 2009) and the black-capped chickadee *Poecile atricapillus* (Feeney et al. 2009)) and has led to related tasks in rats (*Rattus norvegicus;* Babb and Crystal 2005; Babb and Crystal 2006a; Babb and Crystal 2006b; Roberts et al. 2008) and rhesus macaques (*Macaca mulatta*; Hampton et al. 2005). In addition to these test based on Clayton and Dickinson's (1998) task, other approaches have also been taken to explore episodic-like memory in non-human animals. These include a working memory version of a *what-where-when* task using an operant approach, which aims at exploring the integration of the three components in the episodic buffer of the working memory system (Hoffman et al. 2009; Skov-Rackette et al. 2006); a *what-where-which* task, which replaces the temporal context with a spatial context (Eacott et al. 2005); spontaneous recall of events from the previous day (Menzel 1999); and emphasis on the binding together of any combination of information about *what*, *where*, *when* and *who* (Schwartz and Evans 2001).

There are, however, a number of factors that distinguish the food-hoarding birds' *What-Where-When* (WWW) memory task from typical episodic memory in humans. Firstly, there is of course the question of autonoetic consciousness: part and parcel of human episodic memory is the subjective experience of travelling back in time and re-experiencing the memory in the awareness that this is something that happened to you personally in the past (Tulving 2001). As it is impossible for us to measure the subjective experience of other animals, the question of whether the animals experience their memories in the same way as humans has to remain open. Secondly, the *what*, *where* and *when* of the WWW memory task are not exactly equivalent to Tulving's (1972) original definition. Remembering *what* (an event) happened, *where* (in which spatial context) and *when* (in which temporal context) is not the same as remembering which item you hid in which particular location and how long ago. Finally, a common property of episodic memories is that information is being retrieved which, at the time of encoding, was not known to be needed in the future. In other words, most episodic memories are typically encoded passively, rather than actively. Actively memorized information may still be recalled using episodic memory, but it may also be moved to semantic memory (e.g. through rehearsal, such as in the case of studying for exams). Food-hoarding birds, theoretically, have a strong incentive to actively encode information about their hoards at the time of making these hoards (Feenders and Smulders 2008). Zentall et al. (2001) have argued that training animals to report on the three aspects of the WWW memory task may induce them to actively encode the information, and that this could lead to a semantic "knowing" (rather than "remembering") where and when which item was encountered (see also Feenders and Smulders 2008; Roberts and Feeney 2009). It is unclear, therefore, whether the WWW memory task really does test (something equivalent to) episodic memory or not. In the current study, we aim to put this question to the test by investigating performance on the WWW memory task by the one species that is known to possess episodic memory: humans. The results should give us more insights into the cognitive mechanisms possibly being tested in other animals in similar tasks.

When the WWW memory task is used with other animals, there is always a certain amount of training involved. This training is not about the "episodic" information; that information is trial-unique. Instead, the training is about learning rules ("semantic" information) which allow us to determine whether the animals can indeed recall the relevant "episodic" information from any given trial. Because we can only observe the animals' behaviour, we have to make sure in a typical WWW that they are motivated to only retrieve one particular type of food at one particular time after hiding. The scrub jays, for example, had to learn that worms went bad after a certain interval (Clayton and Dickinson 1998), and the magpies had to learn which colour of food was edible after which retention interval (Zinkivskay et al. 2009). Only after learning these rules, could they show us that they remembered where which food was hidden, and how long ago the hiding had happened.

For humans, however, this training is not necessary. We can ask humans directly to tell us which items were hidden in which locations and on which occasions. This not only means that experiments are shorter to run (no lengthy training), it also means that we can explore more easily different aspects of the WWW memory task than we can in animals. Our measure of memory performance in animals is based on where they do and do not look. Therefore, it is difficult to get a good measure of the memory strength for items they are not supposed to search for, while it is also often difficult to ascertain whether an error is due to a misremembering of the *what*, *where* or *when* aspect of the task. In humans, we can simply ask them about all these aspects. Some of these things can of course be tested in animals, but only in tasks in which integration of the three components is not essential to solve the task, as has been done with macaques and with pigeons (*Columba livia*; Hoffman et al. 2009; Skov-Rackette et al. 2006). Finally, with human participants, we can manipulate whether they actively encode the WWW information or not, by modifying the instructions given.

We therefore designed a WWW memory task for humans, which mimics as closely as possible the food-hoarding birds' experience in a single given trial: the participants hide two types of items on

each of two separate occasions, and are then tested for their memory of *what* was hidden *where*, and *when*. In addition, they are also tested on a "real" test of episodic memory: unexpected questions about the context of each of the two hiding episodes that were irrelevant to the actual task (see Method and Appendix). To investigate the influence of active vs. passive encoding of the information, we had two groups: an Active group that mimics the birds' situation closely (i.e. they knew that items would need to be retrieved in the future) and a Passive one that represented a more typical human episodic memory situation.

METHOD

Forty human participants (16 males and 24 females; 36 students between the ages of 18 to 23, 2 non-students of similar age and 2 non-students of 56 and 57) participated in the study, which was approved by the School of Psychology internal ethics committee. Each participant underwent the same procedure, which was adapted from our magpie experiment (Zinkivskay et al. 2009), over three consecutive days. On Day 1, participants were asked to hide four low-value coins (2 pence) and four higher-value coins (20 pence) in a cluttered living room. On Day 2, they again hid four 2p and four 20p coins in different locations from those used on Day 1. To prevent the participants from verbally rehearsing the locations and their content while they were hiding them (something non-human animals cannot do), they continuously recited a nursery rhyme while performing the task (articulatory suppression; Hanley 1997). On Day 3, the participants were asked (using free recall in any order they preferred) where they had hidden which type of coin on which of the previous days. None of the coins were actually present on Day 3, but the participants were allowed to walk around the room.

Each participant was allocated to one of two conditions. The first participant was randomly allocated, and consequent participants were alternated between conditions. In the Active condition,

participants were told that they were hiding the coins for themselves to retrieve later, and that on Day 3, they would get to keep the first 5 coins for which they correctly recalled the coin/location/occasion combination. This gave them an incentive to pay attention to coin type while hiding them, and on Day 3, to list the locations and occasions of the 20p coins first. In the Passive condition, participants were told they were hiding the coins for someone else. On Day 3, all participants were given the same instructions: to list all the coins that they had hidden, including their locations and the days on which they had been hidden. They were also told (or reminded) that they would get paid the value of the first 5 coins for which they correctly recalled all three aspects. No feedback was given until they had finished listing all the coins they remembered. Additionally, the participants were presented with a set of questions about the context of each of the two hiding sessions (henceforth "episodic memory questions"). The same 16 questions were asked about each session, for a total of 32 answers given (see appendix). Because each question was asked specifically and separately about each of the two hiding episodes, a general memory of e.g. having seen a guitar or having seen the TV on is not enough to answer the question correctly. It has to be linked to the specific episode about which the question was asked. We manipulated the room in such a way that for many of the questions, the correct answer for Day 1 was different from the correct answer for Day 2. We believe that these questions tap into our real everyday experience of episodic memory, unlike list learning, which has been shown not to correlate with people's real-world experience of episodic memory performance (Plancher et al. 2008). Finally, we asked the participants to describe how they had recalled the information. We explicitly asked them whether they "remembered themselves moving around the room and placing the coins in the different places on the two days" or whether they "just knew where the coins were". The former was classified as "episodic" and the latter as "semantic".

We calculated the proportion of correctly recalled coin/location/occasion combinations out of the maximum number of correct responses (8 for 1 day, 16 for both days together). We also calculated

the proportion of correctly recalled locations (regardless of whether the other two aspects were correct) out of the maximum possible correct responses. Sometimes, the participants claimed to have hidden a coin in a location where they in fact never did hide a coin. In such cases, it is usually not possible to identify which correct site they meant. Therefore, for those occasions, we were not able to score whether they recalled the correct coin or correct occasion for that location. The proportions of correct coin types and correct occasions were therefore calculated for the correctly recalled locations only. Finally, we calculated the proportion of correctly answered episodic memory questions out of 32 (or 16 for one day). All proportions were arcsine-square root transformed and analyzed using the General Linear Model in SPSS 15.0 ® for Windows. We used an alpha-level of 0.05. All results are presented as means ± standard error of the mean.

RESULTS

Eighteen participants in each condition won the maximum amount possible (£1.00) by first listing 5 completely correct locations and occasions for 20p coins. The other two participants in the Active condition received 82p (i.e. their first 5 correct answers included one about a 2p coin), while in the Passive condition, one received 82p and the other 64p. All participants performed above chance on all aspects of the task: correct coin/location/occasion combination, correct coin, correct occasion, correct location and the episodic memory task (one-sample t-tests comparing to 50% correct, all *p*-values <0.0005). Participants in the Active treatment did better across the board (i.e. on all aspects of the task combined) than those in the Passive treatment (RM ANOVA, between-subject factor $F_{1,38}$=4.51, p=0.040). In both treatments, participants performed best (i.e. got a higher proportion of answers correct) on the "where" and "when" aspects of the task, next best on the "what" aspect, and worst on the episodic memory questions (RM ANOVA, within-subject factor $F_{3,36}$=32.69, p<0.0005). There was no significant interaction between treatment and which aspect of

194 performance was measured ($F_{3,36}$=0.877, p=0.462; Fig. 1). The variances of the four performance
195 measures were not significantly different between the two treatments (Levene's tests for equality of
196 variance: all p>0.1).

197 On Day 3, participants in both groups remembered more correct WWW combinations from Day 1
198 than from Day 2 (RM ANOVA: Day: $F_{1,38}$=18.83, p<0.0005; Day*Group interaction: $F_{1,38}$=0.219,
199 p=0.643; Fig. 2). This difference seems mainly due to a difference in memory for locations and a
200 difference in memory for coins. Participants in both groups remembered more locations and more
201 coins from Day 1 than from Day 2 (locations: Day: $F_{1,38}$=11.77, p=0.001; Day*Group interaction:
202 $F_{1,38}$=0.021, p=0.885; coins: Day: $F_{1,38}$=11.88, p=0.001; Day*Group interaction: $F_{1,38}$=0.486, p=0.490).
203 There was no difference in how well they remembered the occasion for the two days (Day:
204 $F_{1,38}$=0.795, p=0.378; Day*Group interaction: $F_{1,38}$=0.664, p=0.420), nor for the episodic memory
205 questions (Day: $F_{1,38}$=0.008, p=0.929; Day*Group interaction: $F_{1,38}$=0.727, p=0.399).

206 To test whether performance on the WWW task was predicted by the performance on the episodic
207 memory questions, we ran a general linear model (GLM) with the proportion of correct
208 coin/location/occasion combinations as the dependent variable, treatment as the independent
209 variable, and episodic memory performance as the co-variate. We found that performance on the
210 episodic memory questions positively predicted performance on the WWW task ($F_{1,36}$=16.54,
211 p<0.0005). When controlling for performance on the episodic memory questions, there was no
212 difference in WWW performance between the two conditions ($F_{1,36}$=0.12, p=0.730), and episodic
213 memory performance predicted WWW performance equally well in both conditions (Interaction:
214 $F_{1,36}$=0.24, p=0.629; Fig. 3). The large majority of participants in both conditions reported using an
215 episodic (i.e. mental time travel) strategy for retrieving the information: 18/20 participants in the
216 Active condition, and 17/20 for the Passive condition. This is significantly higher than expected by
217 chance (χ^2_1=22.5, p<0.0001), and is not significantly different between the two treatments (χ^2_1=0.23,
218 p=0.63).

We then compared the performance on the three separate aspects of WWW (i.e. coin (*what*), location (*where*) and occasion (*when*)) to each other and related performance on these separate aspects to episodic memory performance, using a repeated-measures analysis with coin vs. location vs. occasion as the within-subjects factor, treatment as the between-subjects factor and episodic memory performance as the co-variate. As we saw before, significantly more mistakes were made with respect to the type of coin than with respect to the location or the occasion ($F_{2,35}$=7.23, p=0.002; LSD post-hoc tests). We again found that those who performed well on the episodic memory questions performed well on all three aspects of the WWW task ($F_{1,36}$=10.00, p=0.003), and that there was no difference between the two treatments in overall performance ($F_{1,36}$=0.38, p=0.544), nor an interaction between treatment and episodic memory performance on overall performance ($F_{1,36}$=0.21, p=0.653). We did, however, find that episodic memory performance differentially predicted performance on the different aspects of the WWW task (task * episodic memory performance interaction: $F_{2,35}$=5.60, p=0.008), and that the extent of the between-treatment differences differed for the three aspects of the WWW task (task * treatment interaction: $F_{2,35}$=3.37, p=0.046). We also found a significant three-way task*treatment*episodic memory interaction ($F_{2,35}$=3.47, p=0.042).

In order to explore the two- and three-way interactions with treatment, we analyzed the two treatments separately. For participants in the Passive condition, episodic memory performance predicted performance on all three aspects of the WWW task equally well (main effect: $F_{1,18}$=8.75, p=0.008; task * episodic memory performance interaction: $F_{2,17}$=0.16, p=0.853). When controlling for episodic memory performance, there was no difference in performance between the *what*, *where*, and *when* aspects of the task ($F_{2,17}$=0.43, p=0.658; Fig. 4a). For participants in the Active condition, however, there was no significant overall effect of episodic memory performance ($F_{1,18}$=3.12, p=0.094), but the effect was significantly different for the three aspects of the WWW memory (task * episodic memory performance interaction: $F_{2,17}$=9.50, p=0.002). Performance on the

where and *when* components was better than on the *what* component ($F_{2,17}$=10.65, p=0.001; LSD post-hoc tests). Episodic memory performance strongly and positively predicted performance on the *what* aspect of the WWW task ($F_{1,18}$=27.00, p<0.0005; β=0.775), but not on the *when* ($F_{1,18}$=0.71, p=0.410; β=0.195) or *where* ($F_{1,18}$=1.31, p=0.267; β=-0.261) aspects (Fig. 4b).

DISCUSSION

Performance on our "real-world" episodic memory task significantly predicted the performance on the WWW task, suggesting strongly that human participants used episodic memory to solve our WWW memory task. This was also borne out in the debriefing, when most participants agreed to having used a strategy that was consistent with mental time travel. This was the case for both the Active and the Passive treatments. Participants in the Active treatment slightly outperformed those in the Passive treatment across all different aspects of performance. Interestingly, this included the performance on the episodic memory questions, of which neither group was aware at the time of memory encoding. This suggests that instructing people to memorize the details of the WWW memory task generally increased their attention and/or awareness of the context in which the task took place, slightly improving episodic memory for the whole event. These results suggest that the WWW memory task is indeed a good test of episodic memory in species that have episodic memory. We are currently testing how performance on this test relates to other, more traditional cognitive and memory tasks. Our results do not, of course, prove that other animals also use episodic memory to solve the task, but if they could, this task would be a good measure of their episodic memory performance.

Interestingly, participants found it easier to recall details of which coins were hidden in which locations on the first day of the experiment than on the second day (a primacy effect). This finding is inconsistent with a temporal decay of the memory traces, as they remembered the older

information better than the newer information. Instead, we suggest three non-mutually-exclusive hypotheses to explain this finding. Firstly, it is possible that the information from Day 1 interfered with the information from Day 2. On Day 1, the experience of the room and of hiding items in the room was unique and never-before-experienced. However, on Day 2, they had already experienced the same situation once before, and this may have interfered with accurate retrieval of this information. We think this explanation is less likely to be the correct one, since such interference should lead especially to mistakes in the *when* component of the task (i.e. assigning items to the wrong occasion), which we did not detect. The second possibility is that information encoded on Day 1 had longer to consolidate (e.g. during sleep), because 2 nights had passed, whereas only 1 night had passed since Day 2. Finally, it is possible that the information from Day 1 was retrieved and reinforced during the hiding session on Day 2, possibly being used in order to avoid placing the new coins in the same locations as the day before. This would mainly apply to the *what* and *where* information, which is exactly what we see in our results. Only further experiments could distinguish between these different hypotheses.

Running this task with humans allowed us to test participants' memories for the different aspects of the WWW memory task separately and relate them to episodic memory performance, something that cannot be done in the animal versions of this task. Episodic memory performance predicted performance on all three aspects of the WWW memory task in the Passive treatment group. This suggests to us that people who did not actively encode the information about which coin type was hidden where and when, rely on episodic memory (i.e. mental time travel back to the hiding occasions) to recall all three aspects of the task. In the Active treatment, however, episodic memory performance only predicted performance on the *what* aspect of the WWW task, but not on the other two aspects. There are a number of possible (non-exclusive) explanations for this. Firstly, because participants in the Active group performed worse on the *what* than on the other two aspects of the task, and because they overall performed slightly better than those in the Passive

group, it is possible that the performance on the *where* and *when* aspects of the task was so close to ceiling in the Active group that there was not enough variability to find a significant correlation with the episodic memory performance. We could not find a significant difference in the variance between the two treatments, but this explanation (essentially a ceiling effect affecting the regression analysis) cannot be excluded, nevertheless. Future versions of the task could be made more difficult by increasing the number of locations/items to be remembered. A second possibility is that the participants in the Active condition used a specific hiding strategy that would make it easier to remember the *where* and *when* components (but not the *what* component). For example, they could have only used a certain type of hiding places on day 1, and another type on day 2. Given that the improvement in performance in the Active vs. the Passive condition is no more for the *where* and *when* components than for the *what* component, this explanation is also not very likely to be true. The final possible explanation of this pattern is that when instructed to actively encode information in memory, a different or additional non-episodic (potentially semantic) memory system is used to encode and retrieve *when* and *where* information. This same system apparently was not used for the *what* component, requiring the participants to rely on an episodic memory strategy to successfully complete the whole task. Future studies will test the idea that other memory systems are involved in different aspects of this task.

In both conditions, people had more difficulty remembering the type of coin they hid than the occasion on which it was hidden or the places where they did the hiding. We used money as the objects to hide because it has intrinsic value to them and its value is well known to the participants. In previous attempts at running this task with humans, we did not let the participants keep any money, and the performance on the *what* aspect of the task was at chance level (unpublished). The incentive of keeping the money seems to have made the participants try harder to recall the information. The low performance on the *what* aspect of the WWW task, and the fact that in the Active group, this is the only aspect of performance predicted by the episodic memory performance,

suggest that the coins are more difficult to recall than the other two aspects of the task. This could be because the coins are only seen for a brief amount of time during the hiding phase, unlike the locations (which remain visible throughout) and the occasion (which remains the same throughout the whole session); or because of possible interference with all the other times in their lives when they have handled and seen these types of coins. It is also possible that the fact that both coin types had some kind of positive value made a difference. In the typical animal versions of this task, the choice is between something valuable (food) and something valueless. In our version, however, both items had intrinsic value upon retrieval (be it different in quantity). Increasing the difference in value between the two coin types, or even giving one of them a negative value, might have improved performance. Along the same lines, the amounts of money involved are very small. Just increasing the absolute value of the reward may improve performance.

We therefore conclude that humans, at least, use episodic memory to successfully solve the WWW memory task. However, depending on the conditions at the time of memory encoding, some aspects of the task may be solved using additional or different memory systems. The aspect of the task that is most dependent on the episodic memory system is the identity of the items placed in particular locations. It seems, therefore, that the most robustly episodic aspect of the WWW memory task may be linking objects to locations, and not the addition of a temporal aspect to the task. This is interesting, given the emphasis that has been placed on these temporal components in the last 10 years (Babb and Crystal 2005; Babb and Crystal 2006a; Babb and Crystal 2006b; Clayton and Dickinson 1998; Naqshbandi et al. 2007; Roberts et al. 2008; Zhou and Crystal 2009; but see Eacott et al. 2005; Easton and Eacott 2008). It might be interesting to validate other putative tests of episodic-like memory in a similar manner.

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346 **FIGURE CAPTIONS**

347 **Fig. 1** Performance for both groups is higher on the *where* and *when* aspects than on the *what*
348 aspect of the WWW memory task. Performance on the episodic memory questions is lower than
349 that on the WWW memory task. Additionally, participants in the Active treatment slightly
350 outperformed those on the Passive treatment on all four measures of performance combined. The
351 measures of performance are the arcsine square-root transformed proportion of correct responses.
352 Error bars represent the Standard Error of the Mean.

353

354 **Fig. 2** Performance for all participants on the overall WWW memory task, as well as on the *where*
355 and *what* aspects of that task, is significantly higher when it comes to remembering what happened
356 on Day 1 compared to Day 2. There is no significant difference for remembering *when* or for the
357 episodic memory questions. The measures of performance are the arcsine square-root transformed
358 proportion of correct responses. Error bars represent the Standard Error of the Mean.

359

360 **Fig. 3** Performance on the episodic memory task significantly predicts overall performance (i.e.
361 getting *what*, *where* AND *when* correct for a given location) on the WWW memory task in both
362 treatment groups. There is no significant difference in the slope of these two regression lines. The
363 measures of performance are the arcsine square-root transformed proportion of correct responses.

364

365 **Fig. 4** Performance on the three different components of the *what-where-when* memory task relates
366 to performance on the episodic memory test in different ways depending on the treatment. **a.** In
367 the Passive condition, performance on *what*, *where* and *when* components are equally predicted by
368 performance on the episodic memory task. **b.** In the Active condition, only performance on the

what component is significantly predicted by performance on the episodic memory task, while *when* and *where* components are not. (Symbols: open squares and black interrupted line: *what*; closed circles and black continuous line: *when*; grey crosses and grey interrupted line: *where*). The measures of performance are the arcsine square-root transformed proportion of correct responses.

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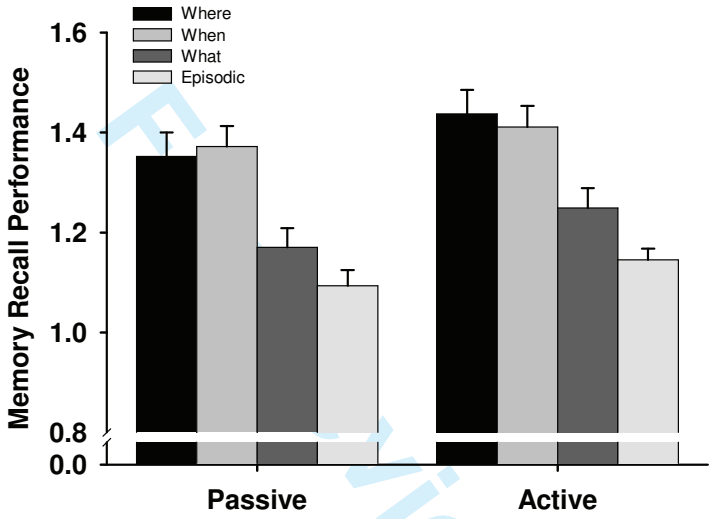

Figure 1

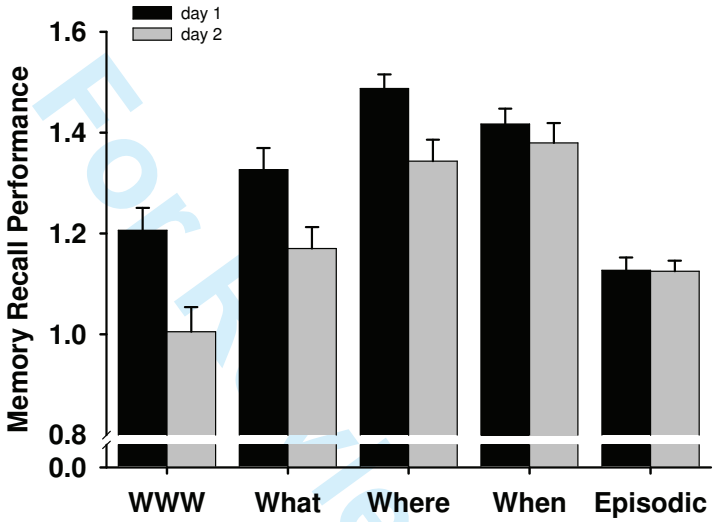

Figure 2

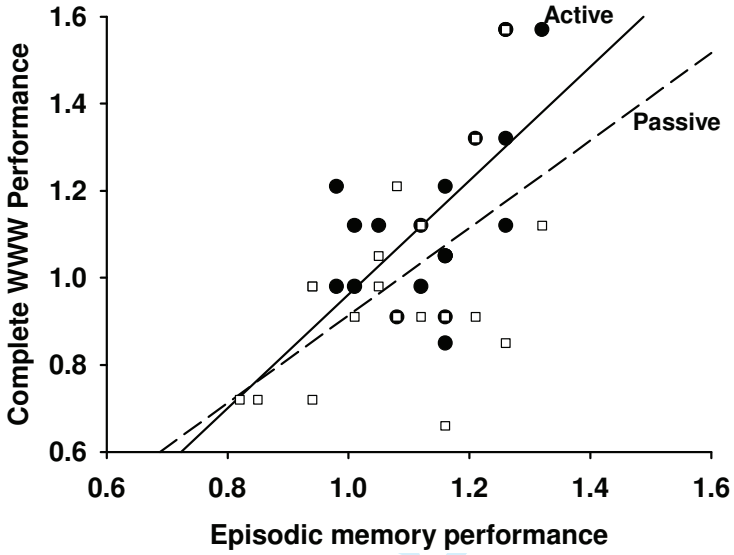

Figure 3

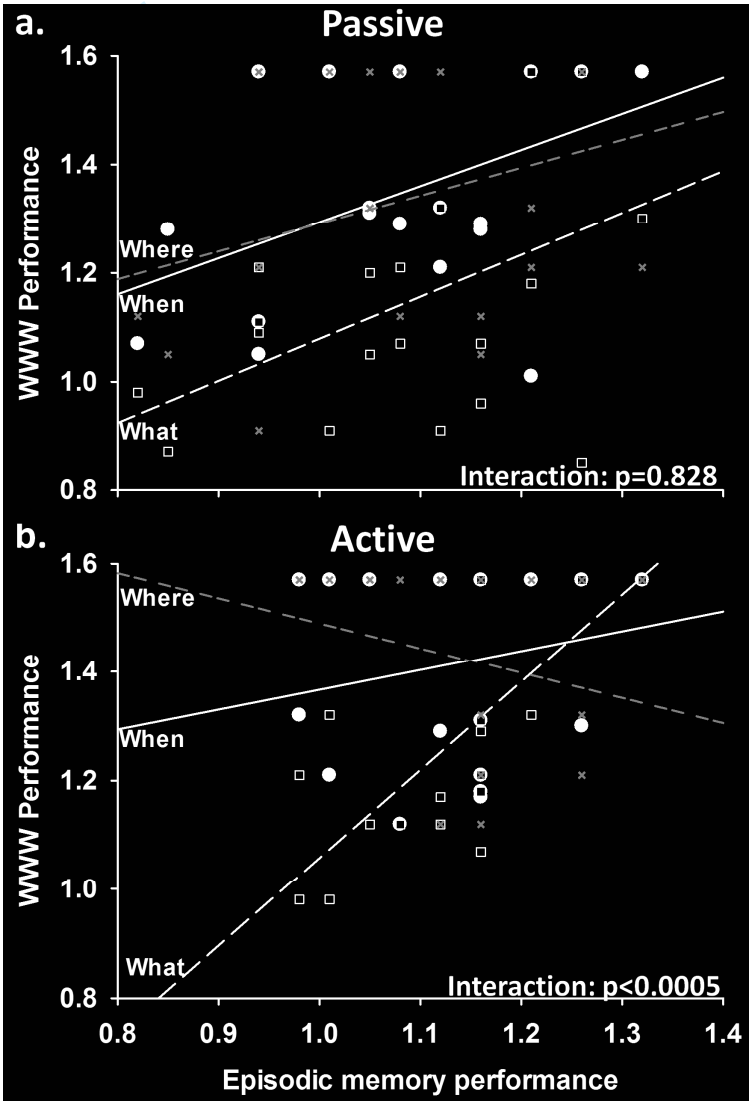
a.
Passive
WWW Performance
1.6
1.4
1.2
1.0
0.8
Where
When
What
Interaction: p=0.828
b.
Active
WWW Performance
1.6
1.4
1.2
1.0
0.8
Where
When
What
Interaction: p<0.0005
0.8
0.9
1.0
1.1
1.2
1.3
1.4
Episodic memory performance

Figure 4

Appendix: Episodic memory questions

All these questions were asked twice: once referring to the first hiding episode and once to the second hiding episode. Some of these were manipulated so that they were correct on day one but not day two and vice versa. Others may have been correct on both or neither day. In order to answer correctly, it is therefore important to mentally go back to the relevant episode.

1) Was it raining when you came to the house?
2) Was there a bike in the hallway?
3) Were there letters and fliers on the floor by the front door?
4) Were there coats on the coat rack in the hallway?
5) Was the living room door open?
6) Was the window in the living room open?
7) Was the television on when you first entered the room?
8) Was the kitchen door open?
9) Was there a rug on the floor in the centre of the room?
10) Were there other people in the house?
11) Was the light on in the living room when you first came?
12) Was the light on in the hallway when you first came?
13) Was there a poster on the wall behind the television?
14) Was the door on the left, before the living room open?
15) Was there a games console on the floor in front of the television?
16) Was there a guitar by the sofa near the window?