

## Episodic memories predict adaptive value-based decision-making

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### Supplementary Methods:

#### **Experiment 1 & 3**

Stimuli. For Experiment 1 we used 120 images of houses (Krebs, Boehler, De Belder, & Egner, 2015). For Experiment 1, participants completed 4 tasks in the following order: Reward, Distracter, Decision, and Memory. For Experiment 3, participants completed 3 tasks in the following order: Reward, Distracter, and Memory. During the Reward task, the houses were yoked to lottery payouts. Accordingly, participants were instructed that they would be playing 60 trials of a game in involving 60 lotteries, each of which would be denoted by a trial unique house. Participants were instructed to pay attention to the houses they encountered because they might encounter them later on in the experiment. Participants were also told that at the end of the experiment one trial would be randomly selected and paid out. The script used during Experiment 1 is below:

*“In this game you will play a number of lotteries. You will be playing 60 trials of this game. Each lottery will be denoted by a picture of a house. You will play a number of different lotteries. On each round, of which there are many, you will encounter a new lottery. You will see a picture of a house and the amount won in that lottery. After each lottery, you must indicate your feelings. So for example, (SHOW PLACCARDS OF GAME), here you can see that this lottery awards \$4. On the next slide you will be asked to determine how you feel – use the keyboard to indicate your response. Here you can see that by keying in a 2 you would indicate that you feel neutral about the split. You will be playing 60 trials of this game, which means you will play with 60 different lotteries, each denoted by a picture of a different house. Pay attention to these lotteries as you may encounter them later in the experiment. At the end of this experiment (after all 4 tasks have been completed), one trial will be realized and paid out. In other words, the computer will randomly select a trial to pay you out.”*

In Experiment 1 during the Decision portion of the experiment, participants were able to select the lottery they preferred to play. Lotteries could either contain house stimuli (either one they had previously seen during the Reward task or a new, completely novel house) or a schematic line drawing of house (same exact stimuli on each trial) that indicated if selected, a new lottery would be selected at random for the participant. Thus, on every trial, participants were always choosing between a schematic house (i.e. a new, random lottery) and a picture of a house stimuli (either a house that was previously encountered in the Reward task or completely novel house stimuli). For all reported analysis, trials in which participants decided between a novel house or a new lottery selected at random were excluded.

#### **Experiments 2 & 4**

Stimuli. For Experiments 2 & 4 we used 120 color images of non-smiling white male faces. These were drawn from the UTEP database (Meissner, Brigham, & Butz, 2005). Each stimulus featured

a unique, yet emotionally neutral (expressionless) face cropped from the bottom of the neck upwards. These 120 images were selected from a larger sample of 179 faces to be the most neutral in terms of 'Attractiveness', 'Approachability' and 'Overall Positive or Negative Feeling', as determined by a separate behavioral cohort (N=24). The ratings task consisted of 179 trials in which subjects were asked to rate each face. For each face, subjects used a sliding bar ranging from 1 to 10 (where 1=not at all and 10=very) to make their ratings. From this data we narrowed down the original pool of 179 faces to 120 faces by calculating the mean ratings of each face along each of the three dimensions (Attractiveness, Approachability, and Overall Positive or Negative Feeling). We selected faces that fell within 1 standard deviation on all three of these ratings. These faces served as the 120 stimuli used in the social tasks.

*Social Manipulation.* For Studies 2 & 4, participants played as Player B in a repeated, single shot Dictator game. Participants saw 60 different offers from 60 different white males. To create a believable cover story of engaging with so many different partners, we told participants that these other players (Player As) had previously come into the lab, were interviewed by the experimenters, photographed, and asked how much money they would split with a future player. Participants were informed that Player As were endowed with \$10 and told they could divide the money however they liked between himself and a future player, Player B,

$$\left( \begin{array}{l} \text{Player A: } \$10 - x \\ \text{Player B: } x \end{array} \right)$$

Participants were explicitly told that on each trial they could receive up to \$5, depending on how Player A decided to split the money with them. Before starting the experiment, participants were also photographed and asked how much money they would split with a future player. We then confirmed whether we could use their photograph and monetary split in future Dictator games. Before starting the task, all participants were required to correctly answer questions about the nature of the task to ensure comprehension. Below is the script that the experimenters used to explain the cover story for the dictator task.

*"You are going to be playing a game with other people. In this game you will be playing a game for real money that you can take home. You will play with a number of other players. These other players are people who we have already brought into the lab, interviewed, photographed and have recorded their responses. There are two players, Player A and Player B. You have been recruited to be Player B. Player As are the partners you will interact with in the experiment. These Players are the subjects that have previously come into the lab and were interviewed. At that time, they were given \$10.00 and told to divide the money between themselves and a future player, which is YOU. They were told they could divide the money however they wanted.*

*You will see these divisions from Player A during this task. On each round, of which there are many, you will encounter a new Player A. You will see their picture and the amount they offered. The nature of the game is that you must accept their offer. After each offer, you must indicate your feelings. So for example, (SHOW PLACCARDS OF*

GAME), here you can see that player A has made an offer of \$4, keeping \$6 for himself. On the next slide you will be asked to determine how you feel – use the keyboard to indicate your response. Here you can see that by keying in a 2 you would indicate that you feel neutral about the split. You will be playing 60 trials of this game, which means you will play with 60 different partners. Pay attention to who you play with because you may encounter these players later in the experiment. At the end of this experiment (after all 4 tasks have been completed), one trial will be realized and paid out to both you and your partner. In other words, the computer will randomly select a trial to pay you out. We will then match the partner on that trial with their actual response, so if your partner decided to split the \$10 with you evenly, you will each receive \$5.00, and you will take home an additional \$5.00 today and we will mail your partner an additional \$5.00 as well.”

### **Experiment 5**

*Non-Social versus Social Instructions for Reward task.* The instructions for the Social and Non-social tasks followed an identical structure:

Social instructions: “You will be playing multiple rounds of a game. In each game, Player A will be endowed with \$1. Then Player A will make an offer ranging between \$0 and \$.50. For example, lets say Player A receives \$1 and then decides to keep \$.70 and gives you \$.30. In this case you will be offered \$.30 and Player A will keep \$.70. You will be asked to rate how you feel. At this point the trial is over, and the game will proceed to the next trial.”

Non-social instructions: “You will be playing multiple rounds of a game. In each game, you will play a lottery represented by a house. At the beginning of each game you will see a unique house that represents that lottery. Then the computer will randomly generate a payout for that lottery ranging between \$0 and \$.50. For example, lets say the lottery pays out \$.30. You will be asked to rate how you feel. At this point the trial is over, and the game will proceed to the next trial.”

### **Supplemental References**

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