Dear editors,   
  
Hereby my co-authors Javier Ortiz-Tudela, Rasmus Bruckner, Yee Lee Shing, and I are writing a pre-submission enquiry to ensure that the work we intend to submit , entitled “The Effect of Prediction Error on Episodic Memory Encoding is Modulated by the Outcome of the Predictions”, is within the scope of *Nature Human Behaviour*.

To simplify the great amount of information which characterizes our daily life, we accumulate knowledge over time and use it to form expectations and guide our actions. Events can sometimes match or mismatch such expectations, creating prediction error of varying degree. While there is a great amount of evidence showing the effects of prediction error on learning, relatively less evidence is available regarding its effect on memory. Moreover, the studies available so far have investigated the effects of reward prediction error, typically by using monetary reward. Since in everyday life learning does not always occur in the present of explicit rewards, it is crucial to consider the mechanistic effects of prediction error in contexts in which no explicit information about reward is conveyed. For this reason, we designed a study in which participants learned context/object-category associations of varying degree from the correct or incorrect outcomes of their predictions. After learning these associations, participants were presented with trial-unique objects that could either match or violate their predictions. Finally, participants were asked to recognize the previously shown objects among distractors. We used a reinforcement learning model to derive subject-specific trial-level prediction error at encoding and link it to subsequent memory. In two different experiments, we showed that prediction error influenced subsequent memory as a function of the outcome of participants’ predictions (correct vs incorrect). Specifically, when participants’ prediction was correct, a strong prediction error (as an outcome of weak expectations) improved memory. By contrast, when participants’ prediction was not correct, a strong prediction error (as an outcome of strong expectations) impaired memory. These results reveal a novel computationally specific effect of prediction error on memory formation, suggesting a dependency between hippocampal and striatal dopaminergic systems, and informing future studies exploring the interactions between learning and memory.

On behalf of all co-authors,   
Francesco Pupillo.