Ok, we think about the future… But are we the only ones?

Believing we established what future is and why it is important for us, humans, one intriguing question is whether or not we are the only species on earth that can think about the future. Bischof-Köhler hypothesis suggests that non-human animals are restricted by their environment and hence cannot be motivated by future needs or states such as thinking about how they will be hungry the following day again. Humans, on the other hand, have a temporal mind that can transcend the "here-and-now", can overcome the limits of their current environment.

However, have you ever read “The Ant and the Grasshopper” by Aesop? The story of the hardworking ant, who works all summer to **prepare** for the harsh winter by carrying heavy vegetables to his home and the fun grasshopper who enjoys his days as if there is **no tomorrow** without caring about the upcoming harsh winter. We know what happens when the winter comes: while the ant sits his warm and comfortable house with his food secure, the grasshopper walks around outside, hoping to find a warm shelter and something to eat. This is a story parents read to their children to teach them the importance of hard work, the importance of thinking ahead. However, wouldn’t it be possible that the grasshopper did not think about the future, not because he did not want to, but he can’t as Bischof-Köhler hypothesis suggests?

Interestingly, we actually do not know about whether grasshoppers can or cannot think about the future because there is no research on their future-oriented behaviours – **BUT** there is a great amount of research showing interesting findings about whether other non-human animals can think about the future. For instance, in 2007, a research group in University of Cambridge published intriguing research with scrub-jays on their ability to think outside of “here-and-now”. The research group created three compartments where the scrub-jays have different experiences. For instance, in Compartment A, there was a caching tray, and the scrub-jays could find breakfast on the mornings

Figure. Figure taken from Raby et a

the scrub-jays were there. In Compartment C, on the other hand, despite the presence of the caching tray, there was no breakfast. Each day, they were fed in Compartment B with non-cacheable treats. Upon eating and satisfying their current need (i.e., hunger), the scrub-jays were given 30 cacheable pine nuts at evening to see if they would cache the nuts in the tray in Compartment C to ensure they have breakfast the following day. What do you think scrub-jays did in this situation: did they cache the pine nuts into the tray at the compartment where they received no breakfast prior, or did they randomly cache the pine cones into the trays?

Well, they did cache the treats into the tray, located in the compartment where they received no breakfast before. Isn't this marvellous to see that birds, in particular scrub-jays can prepare for a future possibility in the present? Isn't it strong evidence of this ability existing in non-human animals?

Not everyone thinks this way though – although it's marvellous that scrub-jays can make adaptive choices for the future, how similar this is to human's way of thinking about the future? For many scientists who study future thinking abilities, the answer is NO. While there is a consensus that some animals can show future-oriented behaviours, there are vast differences in how it's received in scientific community. Remember the Bischof-Köhler hypothesis. The argument is that animals are

restricted by their current states, and hence in this scenario scrub-jays planning for breakfast is not the same as humans planning for their next trip. While the scrub-jays' behaviour is bound to their survival, the humans' behaviour is not. We can explain scrub-jays' behaviour in terms of learning the link between compartments and breakfast presentation.

Click here to see more about what birds can do, when it comes to the future:

What about the Great Apes, the closest “relatives” of humans? Can they think about the future like humans do? In their 2006 study, Mulcahy and Call examined orangutans and bonobos’ future thinking abilities, in particular their tool use. They presented the apes with two tasks: a tube task and a hook task. In both tasks, the apes encountered a problem in the testing room: they cannot get their food because it was locked and they needed a tool to release the food. They were then presented with items including the necessary tool. The researchers were curious to see if the apes could (i) select the correct tool, (ii) take the tools with them in the waiting room, and (iii) use it to solve the problem in the testing room. The researchers also manipulated how long the apes needed to wait in the waiting room. It appears that apes CAN select the correct tool, take it with them to first waiting room, and then to the testing room to solve the problem. In addition, some apes were able to successfully use the tool even after waiting for 14 hours. Many other researchers also show similar behaviours in other apes, such as orangutans.

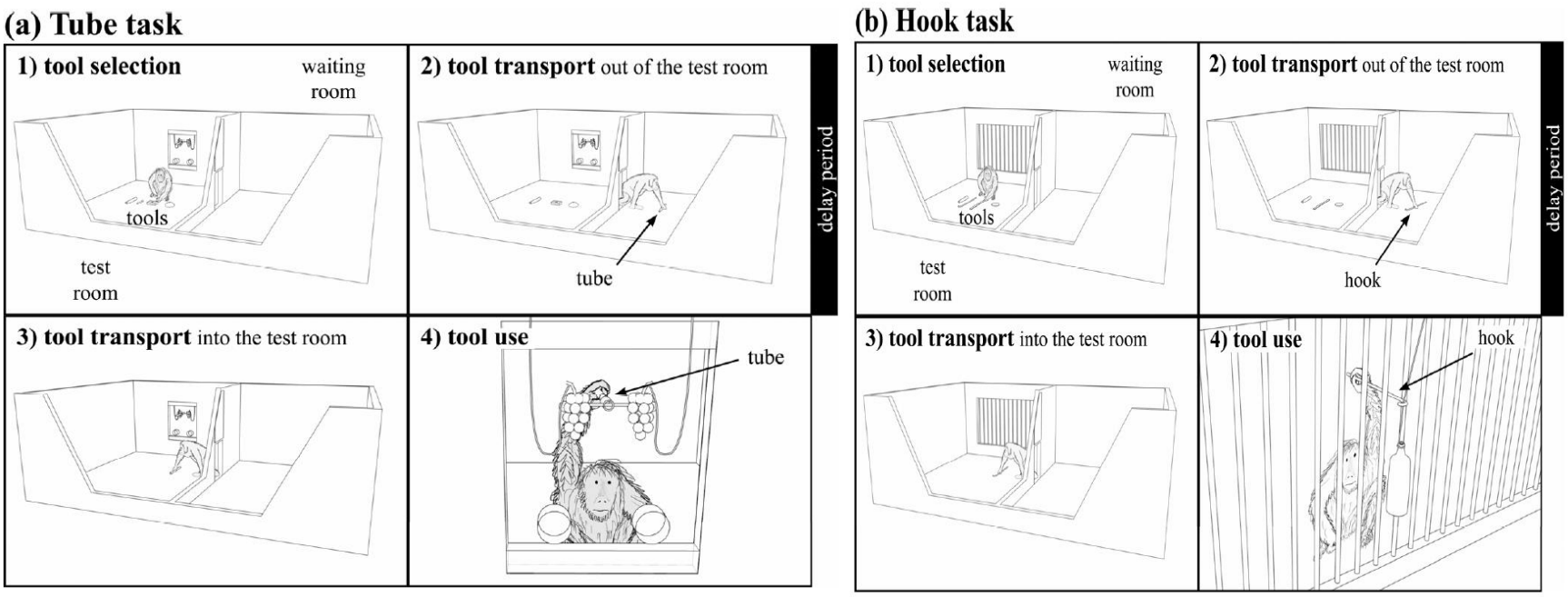

Figure. Figures taken from Mulcahy and Call (2006) Supplementary Materials

However, these behaviours are still motivated by more survival instincts such as hunger. An interesting question is whether animals can be motivated not only by their survival (e.g., food) but also by enjoyment? In 2012, Osvath and Karvonen provided some answers to this question. They had observed a male chimpanzee, who not only throw stones at the visitors as a play, but also stacked some items prior to the arrival of the visitors. The researchers also noted that he hid these

items from his caretakers. This is clearly not motivated by food, it is a playful act on the chimpanzee, and he demonstrated that he can indeed think about a future situation and prepare for it.

We might also want to ask that seeing the success of non-human animals in future-thinking tasks, are these behaviours qualitatively similar to those of humans? One way to examine this is to see whether or not non-human animals' performance exceeds the performance of developing humans, children. You might wonder why we do not compare animals' performance with human adults – that's a fair question. Human adults already achieve a certain level of success; they will almost always complete the assessment such as reporting what they will do the other day or imagining what will happen in a certain novel situation. However, with non-human animals and children, they are still developing and their cognitive abilities might be masked by their language abilities. For instance, while an adult human can reflect on what they think will happen and provides a coherent narrative of their internal thoughts, the same cannot be said for non-human animals and children. Therefore, it's important to see whether or not non-human animals perform at similar levels as human children.

The research on children's future thinking abilities shows consistent development, in particular during preschool period (between 3- and 5-years of age). In 2011, Suddendorf and his team used a

two-room paradigm, similar to Mulcany and Call (2006). In the first room, they first introduced a locked box to preschoolers; and in the second one, there was a key for the box. Children were told that they would visit the first room later and the researchers observed if children selected the correct tool. Around 4 years of age (close to 5), children seemed to select the correct key for the locked box. By adopting similar tasks, many researchers have also replicated this finding, supporting the notion that thinking about the future seemed to develop around 4-years of age. When compared to the performance of Great Apes and children, apes' performance is at similar levels as preschool age children's performance, suggesting a possible non-linguistic component of future-thinking across species.

Benefitted Readings and Works Cited

Atance, C. M. (2008). Future Thinking in Young Children. *Current Directions in Psychological Science*. https://doi.org/10.1111/j.1467-8721.2008.00593.x

Atance, C. M., Louw, A., & Clayton, N. S. (2015). Thinking ahead about where something is needed: New insights about episodic foresight in preschoolers. *Journal of Experimental Child Psychology*, *129*, 98-109. https://doi.org/10.1016/j.jecp.2014.09.001

Clayton, N. S., Bussey, T. J., & Dickinson, A. (2003). Can animals recall the past and plan for the future? *Nature Reviews Neuroscience*, *4*(8), 685-691. https://doi.org/10.1038/nrn1180

Dickerson, K. L., Ainge, J. A., & Seed, A. M. (2018). The role of association in preschoolers' solutions to "Spoon Tests" of future planning. *Current Biology*, *28*(14), 2309-2313.e2. https://doi.org/10.1016/j.cub.2018.05.052

Mulcahy, N. J., & Call, J. (2006). Apes save tools for future use. *Science*. https://doi.org/10.1126/science.1125456

Osvath, M., & Karvonen, E. (2012). Spontaneous innovation for future deception in a male chimpanzee. *PloS one*, *7*(5), e36782. https://doi.org/10.1371/journal.pone.0036782

Osvath, M., & Osvath, H. (2008). Chimpanzee (Pan troglodytes) and orangutan (Pongo abelii) forethought: self-control and pre-experience in the face of future tool use. *Animal Cognition*, *11*(4), 661-674. https://doi.org/10.1007/s10071-008-0157-0

Phidal Publishing. (2014). *The ant & the grasshopper*.

Redshaw, J., & Bulley, A. (2018). Future-thinking in animals: Capacities and limits. In G. Oettingen, A. T. Sevincer, & P. Gollwitzer (Eds.), *The psychology of thinking about the future* (pp. 31–51). The Guilford Press.

Science Magazine. (2017, July 13). *Ravens—like humans and apes—can plan for the future* [Video]. YouTube. https://www.youtube.com/watch?v=O6nNllouHpw

Suddendorf, T., & Corballis, M. C. (1997). Mental time travel and the evolution of the human mind. *Genetic, Social, and General Psychology Monographs, 123*(2), 133–167.

Suddendorf, T., Nielsen, M., & von Gehlen, R. (2011). Children's capacity to remember a novel problem and to secure its future solution. *Developmental Science*, *14*(1), 26–33. https://doi.org/10.1111/j.1467-7687.2010.00950.x