ARTICLE

Choice and control for animals in captivity

Laura M. Kurtycz looks at how to counter 'learned helplessness'

Today, by reading this sentence, you made a choice about what to do with your time. In fact, every day you make dozens of choices that you may not even realise you are making – what to do, when to eat, where to go, with whom to spend time... the possibilities are nearly endless. However, when we lack control over our actions, we can suffer from 'learned helplessness' and we may stop trying to make choices altogether. The same is true for animals living in captivity.

For some animals this can lead to serious negative consequences evidenced behaviourally and physiologically. Could providing choices to captive animals alleviate the symptoms associated with a lack of control and improve welfare? And what might it be able to tell us about their cognition and decision making?

questions

In what other ways can we increase control for animals in captivity?

How can we provide choices to improve the welfare of humans who are lacking control? (E.g. children, people in prisons, nursing homes, etc.)

resources

Ross, S.R. (Ed.) (2013). Welfare of zoo animals [Special issue]. *Applied Animal Behaviour Science, 147*(3–4).

24/7 Animal Welfare: www.247animalwelfare.eu

Imagine that you are sitting in your classroom at school, when two researchers come into your classroom and ask you to solve a special set of puzzles. They explain that they will show you a card with a picture of coloured blocks, and you are to use the blocks in front of you to match the picture – a seemingly simple task. What they have not told you is that while one of the researchers will show you solvable tasks, the other researcher has puzzles that are impossible to solve; you have not been given blocks that match the pictures on her cards. The purpose is to see if you will continue to try to solve the puzzles, or, when you discover the puzzles are unsolvable, to see if you will give up. Over and over, the researcher shows you cards with patterns you are unable to recreate. Eventually, would you stop trying? What if she later started to show you solvable puzzles like the other researcher?

The chances are that you would eventually give up – you learn that no matter what you do, you're unable to solve the puzzles. This is exactly how the 11-year-old schoolchildren in a study like this responded – when they realised that they could not solve the tasks, they stopped trying, even when the researcher started to present solvable puzzles (Dweck & Reppucci, 1973). This is a phenomenon known as 'learned helplessness', in which a person internalises the idea that his or her actions have no effect on their environment (Seligman, 1975).

While learned helplessness has been well documented in humans, the causes and effects of learned helplessness are not unique to us. In captive nonhuman animals, learned helplessness can also be induced in a number of ways, as demonstrated by Seligman's early work with dogs (Seligman & Maier, 1967). Beyond an experimentally induced state of learned helplessness, animals in captivity intrinsically have much less control over their lives than their wild counterparts (Hosey, 2005). While wild animals make a myriad choices every day – where to go, what to eat, where to sleep, who to mate with – animals in captivity have the vast majority of choices made for them by their human caretakers. They also have little to no control over the environment surrounding them, including stimuli like lights, music and temperature. Due to this lack of control, animals in captivity may develop learned helplessness, just like the frustrated schoolchildren.

To alleviate the effects of this lack of control, captive animal caretakers have started to find ways to give control back to the animals. One way in which researchers and animal care providers have attempted this has been the implementation of a 'consumer-demand' approach, in which captive animals are able to make increased choices about certain aspects of their daily lives (Schapiro & Lambeth, 2007).

Preferences

When researchers give animals choices, they find that animals all have their own individual preferences (which does not come as a surprise to anyone who has ever had a picky pet). Animals like specific foods, locations, social partners, objects and activities, and captive chimpanzees even give distinct calls ('rough grunts') when given highly preferred foods, which differ based on the individual (Slocombe & Zuberbühler, 2006).

Researchers have also found that animals in captivity will work for things

references

Anderson, U.S., Benne, M., Bloomsmith, M.A. & Maple, T.L. (2002). Retreat space and human visitor density moderate undesirable behavior in petting zoo animals. *Journal of Applied Animal Welfare Science, 5*(2), 125–137.

Buchanan-Smith, H.M. & Badihi, I. (2012). The psychology of control: Effects of control over supplementary light on welfare of marmosets. *Applied Animal Behaviour Science, 137*(3), 166–174.

Dweck, C.S. & Reppucci, N.D. (1973). Learned helplessness and reinforcement responsibility in children. *Journal of Personality and Social Psychology, 25*(1), 109.

Finestone, E., Bonnie, K.E., Hopper, L.M. et al. (2014). The interplay between individual, social, and environmental influences on chimpanzee food choices. *Behavioural Processes, 105*, 71–78.

Gaalema, D.E., Perdue, B.M. & Kelling, A.S. (2011). Food preference, keeper ratings, and reinforcer effectiveness in exotic animals. *Journal of Applied Animal Welfare Science, 14*(1), 33–41.

Greenwood, V.J., Smith, E.L., Goldsmith, A.R. et al. (2004). Does the flicker frequency of fluorescent lighting affect the welfare of captive European starlings? *Applied Animal Behaviour Science, 86*(1), 145–159.

Hopper, L.M., Kurtycz, L.M., Ross, S.R. & Bonnie, K.E. (2015). Captive chimpanzee foraging in a social setting: A test of problem solving, flexibility, and spatial discounting. *PeerJ, 3*, e833.

Hopper, L.M., Lambeth, S.P., Schapiro, S.J. & Brosnan, S.F. (2013). When given the opportunity, chimpanzees

they like. For example, captive chimpanzees will exert extra effort to receive preferred foods (e.g., Hopper et al., 2013; van Leeuwen et al., 2013) and will walk further to get those foods when given a choice (Hopper et al., 2015). Zoo-housed giant pandas and African elephants have been shown to respond better to training requests when they are rewarded with their preferred foods (Gaalema et al., 2011). Even laboratory-housed mice show a preference for additional space and will 'work' to obtain it (Sherwin & Nicol, 1996).

Other types of preferences emerge as well. Zoo-housed gorillas choose to spend more time in dense and complex areas of their exhibit and less time in wide-open spaces (Ross et al., 2011; Stoinski et al., 2001), while captive marmosets, small, Neotropical monkeys, not only prefer to be outside, rather than inside, but also show less stress when they have the option to spend time outside (Pines et al., 2007). It is not just primates who show preferences, either. Captive European starlings, for example, have been shown to prefer areas lit by fluorescent lights with a higher level of 'flicker' frequency (Greenwood et al., 2004).

Understanding captive animals' preferences can be valuable when designing environments and enrichment for them. However, the practical usefulness of this information is limited. For one thing, we cannot tell if animals prefer something because they actually like it, or if they are avoiding something they do not like (i.e. perhaps the marmosets were simply avoiding the indoor space). In addition, while much of the early research studied individual animals (e.g. Seligman's work with dogs), we now know that social animals' choices may be influenced by their social environment (e.g. Finestone et al., 2014), and so social group should also be taken into account when studying social animals.

Lincoln Park Zoo/Todd Rosenberg Photography

Chimpanzees and gorillas respond positively to being given the choice to go outside

But what if we go a step further – are choices important on their own? Does the simple act of getting to choose make a difference?

Choice

In fact, researchers have found that just having choices does have a positive effect on behaviour, even when animals do not take advantage of them. Zoos are well suited to investigating this type of question, because modern zoos regularly build animal exhibits with several different locations for animals. These buildings often include at least one 'on-exhibit' space (an indoor or outdoor habitat, or enclosure, where the public can view the animals), and a behind-the-scenes, 'off-exhibit' area that is not viewable by the public. Traditionally, where zoo-housed animals spend their time, whether on- or off-exhibit, is determined by humans. Such housing is thus an excellent place to study animals' responses to being allowed to choose their location, because of the ease with which researchers can manipulate the variables – namely, the ability to provide animals with a choice to leave one area and enter another, or not.

When giant pandas, which were typically kept in their outside enclosure at a zoo, were given the choice to go into a small room out of the public eye, they were less agitated and showed a decrease in stress, as measured by urinary cortisol, even when they chose to remain outside (Owen et al., 2005). When given a similar choice over where to spend time in their exhibit, polar bears also showed positive behavioural changes – their positive social behaviour increased, and their abnormal behaviours, such as pacing, decreased (Ross, 2006). In both studies, the animals benefited from the additional choice they were given, even though they only used it a limited amount of the time; the pandas used their off-exhibit room 33 per cent of the available time, and the polar bears used theirs less than 2 per cent of the available

maximize personal gain rather than 'level the playing field'. *PeerJ, 1*, e165.

Hosey, G.R. (2005). How does the zoo environment affect the behaviour of captive primates?. *Applied Animal Behaviour Science, 90*(2), 107–129.

Kurtycz, L.M., Wagner, K.E. & Ross, S.R. (2014). The choice to access outdoor areas affects the behavior of great apes. *Journal of Applied Animal Welfare Science, 17*(3), 185–197.

Owen, M.A., Swaisgood, R.R., Czekala, N.M. & Lindburg, D.G. (2005). Enclosure choice and well-being in giant pandas: Is it all about control?. *Zoo Biology, 24*(5), 475–481.

Perdue, B.M., Evans, T.A., Washburn, D.A. et al. (2014). Do monkeys choose to choose? *Learning & behavior, 42*(2), 164–175.

Perlmuter, L.C. & Monty, R.A. (1977). The importance of perceived control: Fact or fantasy? Experiments with both humans and animals indicate that the mere illusion of control significantly improves performance in a variety of situations. *American Scientist*, 759–765.

Pines, M.K., Kaplan, G. & Rogers, L.J. (2007). A note on indoor and outdoor housing preferences of common marmosets (*Callithrix jacchus*). *Applied Animal Behaviour Science, 108*(3), 348–353.

Ross, S.R. (2006). Issues of choice and control in the behaviour of a pair of captive polar bears. *Behavioural Processes, 73*(1), 117–120.

Ross, S.R., Calcutt, S., Schapiro, S.J. & Hau, J. (2011). Space use selectivity by chimpanzees and gorillas in an indoor–outdoor enclosure. *American Journal of Primatology, 73*(2), 197–208.

time. Similarly, when goats and sheep in a petting zoo were given the option of a 'retreat space' and could choose to retreat rather than interact with visitors, they too showed lower rates of undesirable behaviours than when they had no such space (Anderson et al., 2002).

Choice also appears to be important for primates. My research with colleagues (2014) found that both chimpanzees and gorillas responded positively to being given the choice to go outside, even when they elected to stay in their on-exhibit, indoor enclosure, compared with when they were housed inside without the option to go outside. With increased control over their environment, chimpanzees, which tend to be more socially active than gorillas, showed an increase in positive social behaviours, such as grooming, when they had the choice to go outdoors. The gorillas' social behaviours did not change, but they did show a general decrease in activity, which can be interpreted as a lack of anxiety or restlessness – they were calmer with increased choice over where to spend time. Even the choice to participate in cognitive testing can lead to positive effects – zoo-housed crested macaque monkeys have shown positive welfare benefits from choosing to voluntarily separate themselves from their group to participate in cognitive testing (Whitehouse et al., 2013). In all of these zoo-based studies, the animals – giant pandas, polar bears, goats, sheep, great apes and monkeys – showed positive responses to being provided with the ability to make a choice, irrespective of whether they exercised that choice.

These results are not limited to zoo-housed animals. Captive animals in laboratory settings have also shown positive responses to the provision of choices. Researchers found that rhesus monkeys showed a preference for choosing the order in which they completed a series of four touchscreen cognitive tasks, rather than completing the same set of tasks in a randomly assigned order (Perdue et al., 2014). Similarly, laboratory-housed marmosets responded positively to being able to turn the light in their cage on or off themselves. Specifically, the monkeys showed a significant increase in calm activity patterns when they were given control over their cage lighting, even compared to a yoked group that had no control, but received the same light schedule (Buchanan-Smith & Badihi, 2012).

Animals in captivity clearly have reduced control over their lives compared with their wild cousins; however, research is paving the way for our understanding of the importance of control and how we can provide choices to create the best possible environments for the animals in our care. It has been shown in humans that even a *perception* of control has psychological benefits, in the absence of actual control (Perlmuter & Monty, 1977). This offers a promising line of inquiry for animals in captivity – although we cannot offer them complete control over all aspects of their environment, perhaps by offering choices within the confines of captivity, we can give some small amount of control, and thus increase their wellbeing.

Lincoln Park Zoo/Todd Rosenberg Photography

The choice paradox

One possible avenue for future research is the 'choice paradox', which describes the perhaps perplexing phenomenon that being given too many choices can actually make humans more stressed. Even when the choices are positive, anxiety increases, and certain brain structures are shown to be involved in both processes (Shenhav & Buckner, 2014).

A future direction for work with animals will be to look at physiological and neurological measures of the importance of control, both through brain scans and hormonal measures.

Laura M. Kurtycz
is a PhD student at Case Western Reserve University and was formerly Research Assistant at Lincoln Park Zoo, Chicago
lmkurtycz@gmail.com

Schapiro, S.J. & Lambeth, S.P. (2007). Control, choice, and assessments of the value of behavioral management to nonhuman primates in captivity. *Journal of Applied Animal Welfare Science, 10*(1), 39–47.

Seligman, M. (1975). *Helplessness: On depression, development, and death*. New York: WH Freeman/Times Books/Henry Holt & Co.

Seligman, M.E. & Maier, S.F. (1967). Failure to escape traumatic shock. *Journal of Experimental Psychology, 74*(1), 1.

Shenhav, A. & Buckner, R.L. (2014). Neural correlates of dueling affective reactions to win–win choices. *Proceedings of the National Academy of Sciences, 111*(30), 10978–10983.

Sherwin, C.M. & Nicol, C.J. (1996). Reorganization of behaviour in laboratory mice, *Mus musculus*, with varying cost of access to resources. *Animal Behaviour, 51*(5), 1087–1093.

Slocombe, K.E. & Zuberbühler, K. (2006). Food-associated calls in chimpanzees. *Animal Behaviour, 72*(5), 989–999.

Stoinski, T.S., Hoff, M.P. & Maple, T.L. (2001). Habitat use and structural preferences of captive western lowland gorillas. *International Journal of Primatology, 22*(3), 431–447.

van Leeuwen, E.J., Cronin, K.A., Schütte, S., et al (2013). Chimpanzees (*Pan troglodytes*) flexibly adjust their behaviour in order to maximize payoffs, not to conform to majorities. *PloS One, 8*(11), e80945.

Whitehouse, J., Micheletta, J., Powell, L.E. et al. (2013). The impact of cognitive testing on the welfare of group housed primates. *PLoS ONE, 8*(11), e78308.