Animal Feelings And Emotions

Introduction to Emotions

Do you ever wonder what your dog is thinking? Does she miss you when you leave for work in the morning? What is he trying to say as he holds that toy in his mouth and wiggles all over, greeting you at the door? While we aren't sure of what they would say, many of us would agree that our dogs certainly have emotions to some extent. But does a hermit crab become sad when its shell is stolen, or does a lobster feel scared when a predator is nearby? If we believe that our dogs have emotions then we should ask whether other animals have them as well, especially those used in food production.

To discuss animal emotions, we first must define emotions and the terminology surrounding it. Emotion is: "A short-lived response to a stimulus that guides animals towards rewards (e.g. food and mates) and away from danger (e.g. freeze, flight, and fight)." Emotions have multiple facets consisting of behavioural, neurological, and physiological components, and can help an individual survive.

Emotion refers to short term feelings, but a less common yet similar term is "affective state", which encompasses both short term emotions as well as an individual's longer lasting moods. Affective states are generally described as being plotted on a graph composed of two axes: valence and arousal.

Valence refers to whether the affective state is positive or negative, whereas arousal refers to the excitement level. For example, high arousal and negative valence would be considered a state such as fear. Positive valence and low arousal would be considered a calm state. In general, an affective state is developed over a longer period of time than an emotion, and it affects how an individual interprets and responds to stimuli. When a person is in a depressed state they are more likely to interpret vague terminology as negative, assuming a pessimistic view. Similarly, it is thought that affective states in animals influence how they respond to stimuli, possibly providing us with insight into the animal's welfare.

Throughout history there have been various beliefs about emotions and the physiological changes humans experience. The theory of emotion by William James and Carle Lange states that emotions are a result of the physiological changes in the body, rather than the emotions causing the physical changes or the two occurring simultaneously(1). To illustrate this theory, imagine you are about to present a speech to a massive audience - your heart might begin to race and you start to perspire as you feel the knot in your stomach. According to the James-Lange theory, these physiological changes are what cause the almost immediate feeling of fear or anxiousness. However, this theory has been criticized and disproven through studies which induce the physiological changes without inducing the emotional change, demonstrating the physiological changes cannot be the sole cause of the emotions.

So then how do emotions work? There are often believed to be two types of emotions - primary and secondary. Primary emotions are those that animals are born with and are more reflex like, helping immediately with survival in the moment. However, secondary emotions are felt and

reflected on, requiring higher brain centers. These secondary emotions are considered by some scientists to require consciousness(2) and are what we typically focus on when referring to animal welfare.

Many researchers have attempted to understand whether animals have emotions, but it is more difficult than it may seem. It is relatively simple to study some aspects of animal behaviour such as reflexes, attentional focus, or memory, but how do you study what a frog is feeling? For humans we utilize self reports to assess feelings, but since animals cannot communicate using our language, we incorporate other methods.

In addition to the rather significant language barrier, another difficulty in studying animal emotion and affective state is the idea of consciousness. Currently we are unable to study consciousness in animals because it requires knowing an animal's awareness of its internal or external existence. However, there are ways around the dilemma by observing animals' actions in various scenarios, allowing us to infer their emotions and affective states.

How Do We Study States or Emotions?

Researchers are able to study affective states in animals using a few different methods. One of the most common is through cognitive bias - a systematic error altering the individual's decisions and judgments, providing insight into the emotions and welfare of an animal.

Cognitive bias research was first demonstrated in humans. A study presented subjects with a 'subliminal expression' - happy, neutral, or unhappy faces that were unable to be consciously seen. During the presentation of the subliminal expression, the subject was consciously viewing a neutral face and reporting to the researchers whether it was male or female. Researchers then observed how subjects responded to a novel item. They presented the subjects with a new drink and measured how many poured the drink and how much each subject consumed. In the meantime, the subject was told to report back their conscious feelings. Those that were shown the happy expression poured and consumed greater amounts of the drink than the other groups. Conversely, those who saw the unhappy subliminal expression poured and consumed the least amount of the drink(3). This suggests those with a more positive affective state are more optimistic; this research has been applied to animals as well by manipulating environments and treatments prior to testing their response toward novel stimuli, such as in the study below.

Does Research Support Animal Emotions?

COGNITIVE BIAS IN INVERTEBRATES

To test cognitive bias in invertebrates, honeybees were put into an anxiety-like state, causing them to act more pessimistically. You may be asking, "How does one make a bee have anxiety?" Researchers are unable to ask bees to deliver an impromptu speech, so to induce anxiety the researchers mimic the bees' predators. Predators tend to shake them during an attempted attack so shaking a bee is theorized to cause anxiety. Researchers taught a group of bees that one stimulus meant they would receive a reward such as 2.00 M sucrose. In anticipation of the reward, the bees would extend their proboscis (mouth-like and used for sucking). The group of bees was also taught that another stimulus meant they would receive an

unpleasant concoction. One half of the bees were then shaken to simulate the predator attack and cause an anxiety-like state. The bees were then tested on an ambiguous stimulus - a novel concoction that was between the reward stimulus and the unpleasant stimulus.

The critical question was how the bees in the anxiety state responded to the new, ambiguous concoction. Bees who had a more positive view of the new substance would extend their proboscis, as they were expecting a positive outcome, whereas those with a more pessimistic view would not extend it. The bees who experienced the anxiety producing state were found to be more ‘pessimistic’ and did not extend their proboscis, while the other group were more likely to extend(4). This was the first study to demonstrate that a honeybee’s state affects its response to an ambiguous stimulus, very similar to the findings in humans regarding novel stimuli and affective states.

PAIN IN CRUSTACEANS

Another important aspect in animal welfare relating to affective state is pain. Nociception occurs when receptors detect tissue damage, then the signal is sent to the Central Nervous System and pain is the unpleasant feeling generated. Nociceptive reflexes are reactions which occur prior to any impulses reaching the brain. Because of the nociceptive reflexes, in some instances there may not be any awareness of tissue damage or any sense of pain. So the role of pain may be to cause the animal to learn to change their behaviour to prevent future damage, whereas nociceptive reflexes prevent immediate danger. These differences are important to consider when studying animal emotions because an animal’s welfare would not necessarily be compromised if they cannot feel pain.

In the past, it has widely been assumed that crustaceans are unable to feel pain and their response to aversive stimuli is solely due to reflexes. Because of this, their welfare has not been prioritized. Dr. Robert Elwood conducted experiments to investigate the validity of this assumption. Dr. Elwood explains there are six criteria which can help determine if an animal is feeling pain or is demonstrating a nociceptive reflex - avoidance learning, motivational trade-offs, long term behaviour change, prolonged direct rubbing, anxiety, and physiological stress. He performed multiple types of experiments to investigate crustacean pain.

One of the most powerful studies utilized a small crustacean, called glass prawns, and analyzed their prolonged direct rubbing associated with different treatments on the antennae. One antenna was treated with either water or an anesthetic. 5 minutes later the same antenna was treated with water again, NaOH, acetic acid or pinched with forceps. After the second treatment, the prawns groomed the affected antenna significantly more if treated with NaOH, acetic acid, or pinched. Additionally, the grooming of the affected antenna was decreased in the prawns which received a local anaesthetic prior to the second treatment. This demonstrates that the individual crustaceans are aware of the source of the damage and the awareness lasts for quite a while, continuing to bother them and cause them to rub it repeatedly - this behaviour is very consistent with the evidence of pain, and likely with emotions, as it involves the Central Nervous System and being aware of the unpleasant experience(5).

CANINE PREFERENCE FOR PRAISE

In addition to demonstrating animals can have feelings of anxiety and pain, research has also

shown that animals can have a preference for experiences which have no survival benefit but are similar to affection, or some would even say love. Dr. Gregory Berns studies canine cognition using an MRI machine. In one study, Dr. Berns examined how dogs respond to praise versus food. Dogs were signaled that they were to receive either hotdogs or praise, while Berns analyzed the activation in the reward areas of the brain, particularly the caudate nucleus. Dr. Berns concluded that some dogs have preferences for either food or praise, and others enjoy both equally(6). At the PennVet Working Dog Conference, Dr. Berns expanded on this and explained that some dogs prefer a reward type based upon the circumstances, very similar to a human's moods.

These findings which demonstrate dogs value praise and food equally, or sometimes even prefer praise, suggest that dogs do not solely have survival needs which influence their behaviour, but also perhaps emotions. While it might be a bit of a jump for Dr. Berns to conclude that this preference for praise means the dogs feel love, it does suggest that the dogs have feelings toward their owners and have a desire to please them despite any clear survival benefits.

PLAY AND PLEASURE

Another aspect of animal emotions is the existence of happiness, especially related to play. Play does not appear to have any survival benefit and seems to exist purely for enjoyment of the animal, suggesting the existence of feelings or emotions. Numerous species are known to attempt to play with others - from dogs to elephants to geckos. When an animal initiates play, they seem to be in a state of a strong desire, or even a need, to play. Even if their first potential playmate declines the invitation they will invite another. If no other animals will play, then they will resort to playing independently, using rocks or other items in the environment to entertain themselves2.

A more specific example of pleasure, or possible existence of happiness, is rat tickling. When a rat is tickled on their abdomen, they let out 50 kHz vocalisations and dopamine (a neurotransmitter related to happiness) is released. Researchers have found that after rats are tickled they demonstrate fewer anxiety and fear related behaviours, reduced stress, and decreased latency for approaching novel items (7). These results after tickling are in line with an optimistic view of stimuli, as explained previously in the cognitive bias testing, strongly suggesting that rats could be experiencing happiness, or at least pleasure, from being tickled.

How Do We Recognize Animal Emotions In The Real World?

While research is critical in understanding animals and provides us the opportunity to manipulate variables, it is also important to be able to recognize states of animals outside the laboratory. One way that we are able to recognize negative states is through stereotypic behaviour. These behaviors are repetitive and appear useless, but have developed due to frustration or repeated attempts to cope. Typically the behaviours are repeated in predictable ways, the animal has difficulty stopping, and they have developed due to insolvable problems. Horses may crib-bite when not given enough enrichment or kept in too small of an area, tigers may relentlessly pace along their enclosure, sows may bite the bars of their crate, and polar bears often demonstrate head swaying.

However, just because stereotypies exist, does that mean that they are in a negative affective state? To explore this, we must look at why stereotypies exist. One reason is frustration - when animals are prevented from acting upon their motivations, they become frustrated and this may lead to displacement activities. A second reason is fear - studies have found tranquilizers can reduce the existence of stereotypies. A third source of stereotypy development is restraint and lack of stimulation.

Stereotypies might have a purpose such as reducing arousal, lowering awareness or responsiveness to aversive stimuli, or reducing pain. In voles they found that the stereotypy of vertical jumping caused a decrease in corticosteroid levels. If the animal performs the stereotypy and is able to better cope with the situation one might say that the animal has 'solved' the problem. However, from a welfare perspective, it would certainly be preferable to prevent the animal from having to resort to stereotypies as a coping method.

While stereotypies may sometimes result from poor welfare, it is also important to not jump to conclusions as there is a genetic component. There is a 5 times greater chance of stereotypies in offspring with a mother who demonstrates them, and 3 times greater chance if the sire demonstrates them. Genetic components could exaggerate the appearance of poor welfare as the animal is more prone to stereotypies. Due to the individual variations, stereotypies alone should not be used to infer an animal's state. Other signals do exist to provide insight into an animal's state such as activity level, response to novel stimuli, and body language (i.e. ear posture).

The studies explained above, as well as the existence of behaviours such as stereotypies, strongly suggest that affective states and feelings are present in animals. However, many questions remain. If animals are determined to have emotions, which animals are included? Does it generalize to all animals? Most likely not. Then how do we assess a species to determine their capability of possessing emotions and to what extent? How do we determine which animals should be treated better than the others? A significant amount of research still needs to be conducted to discover which animals experience emotions and if more stringent legislation should be put in place to ensure the welfare of all, especially those utilized in farming. Without further research on these animals and their emotions, we may be unnecessarily catering to some, while unintentionally mistreating others.

References

1. Cherry, K. (2019, October 15). How Does the James-Lange Theory Account for Emotions? Retrieved from https://www.verywellmind.com/what-is-the-james-lange-theory-of-emotion-2795305.
2. Bekoff, M. (2000). Animal Emotions: Exploring Passionate Natures. BioScience, 50(10), 861. doi: 10.1641/0006-3568(2000)050[0861:aeepn]2.0.co;2
3. Winkielman, P., & Berridge, K. C. (2004). Unconscious Emotion. Current Directions in Psychological Science, 13(3), 120–123. doi: 10.1111/j.0963-7214.2004.00288.x
4. Bateson, M., Desire, S., Gartside, S. E., & Wright, G. A. (2011). Agitated Honeybees Exhibit Pessimistic Cognitive Biases. Current Biology, 21(12), 1070–1073. doi: 10.1016/j.cub.2011.05.017
5. Barr, S., Laming, P. R., Dick, J. T., & Elwood, R. W. (2008). Nociception or pain in a decapod crustacean? Animal Behaviour, 75(3), 745–751. doi:

10.1016/j.anbehav.2007.07.004
6. Morris, C. (2019, September 19). Neuroscientist Proves What You Already Knew: Your Dog Really Does Love You. Retrieved from https://fortune.com/2017/09/26/your-dog-loves-you-study/.
7. Lafollette, M. R., O'Haire, M. E., Cloutier, S., Blankenberger, W. B., & Gaskill, B. N. (2017). Rat tickling: A systematic review of applications, outcomes, and moderators. Plos One, 12(4). doi: 10.1371/journal.pone.0175320
8. Affective States. (n.d.). Retrieved from https://horback.faculty.ucdavis.edu/assessing-affective-states/.

edubirdie.com