MEASURING ANIMAL WELFARE AND APPLYING SCIENTIFIC ADVANCES - WHY IS IT STILL SO DIFFICULT?

UFAW International Symposium 27th-29th June 2017
Royal Holloway, University of London, Surrey, UK

BIOGRAPHIES OF KEYNOTE SPEAKERS AND ABSTRACTS

Professor Georgia Mason
University of Guelph, Canada

'The welfare significance of abnormal repetitive behaviours'

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Abnormal Repetitive Behaviours (ARBs) are a heterogeneous group of activities that range from forms derived from intention or redirected movements (e.g. escape-related 'scrabbling' in mink, feather-plucking in hens) through to forms indicating basal ganglia dysfunction (e.g. jumping and backward somersaulting in deer mice), with the aetiology of most being unknown (and what forms should be included as ARBs [e.g. wheel-running?] also being a matter of debate). Despite this lack of clarity (which reflects a need for more empirical research), some strong themes emerge when examining the relationships between ARBs and animal well-being. First, at the group level, prevalent ARBs specifically typify populations with aversive past and/or current experiences (with growing evidence that ARBs may reflect cumulative lifetime welfare). Second, the few exceptions to this type of pattern are largely 'false negatives', wherein, despite poor welfare, animals fail to develop ARBs. One likely explanation for this is that some types of aversive treatment promote inactive rather than active response styles (e.g. hiding, instead of repeated escape attempts that then develop into ARBs). Third, when focusing on individual differences *within* groups of similarly treated animals, subjects with spontaneously high levels of ARB are *not* consistently those with the poorest welfare. Again this pattern seems to be explained by response style: faced with aversive conditions, some individuals become highly inactive instead of displaying high levels of ARB. Thus ARBs are not good ways to identify which individuals are coping best or least well with a welfare-challenging situation; nor is genetically selecting against ARB likely to be a valid way to improve animal welfare.

Overall, the absence of ARBs in a population or management system is thus necessary, but not sufficient, to infer good lifetime well-being (being insufficient because ARBs are not always sensitive welfare indicators, being prone to false negatives). However, the presence of ARBs in a population or management system (e.g. as is common in lab mice, zoo-housed elephants and giraffes, and gestating sows) *is*, in contrast, reliably informative, warning of compromised welfare during these animals' lifetimes.

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Georgia Mason is a behavioural biologist whose research interests are in the objective assessment of animal welfare, and the chronic effects that captive housing can have on brain, behaviour and well-being. She has a Ph.D. in animal behaviour from Cambridge University, where she also held a Clare College post-doctoral research fellowship. She taught vertebrate evolution and animal behaviour for 10 years in Oxford University's Zoology Dept., where she was also a David Phillips BBSRC fellow. She moved to Canada in 2004 to take up a Canada Research Chair at University of Guelph. Professor Mason has over 150 publications, including papers in *Nature*, *Science* and an edited, co-authored book on stereotypic behaviour.
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Professor Mike Mendl
University of Bristol, UK

'Animal affect: What is it, what do we know, and what can we know?'

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Measuring animal welfare remains difficult, even after more than 40 years of research. Long-standing debates about what welfare actually is, how to define it, and hence how to measure it underlie these difficulties, but even with their potential resolution through an emerging consensus that welfare is to do with what animals feel – their emotional (affective) states – significant challenges remain. These include: (i) defining animal affect; (ii) establishing what affective state an animal is in; (iii) finding measures that reflect this state; (iv) establishing whether animal affect is consciously experienced.

We can address challenge (i) by defining animal affect operationally, for example in behavioural terms. One such definition stems from a reinforcement-based view of affect: affective states are those associated with rewards and punishers, where rewards generate positive affect and are things for which animals will work, whilst punishers generate negative affect and are things that animals work to avoid (e.g. Mowrer, Gray, Rolls). This definition captures the notion of valence (positivity or negativity of affect) which is integral to dimensional views of human emotion and fundamentally important in an animal welfare context. It allows us to tackle challenge (ii) by providing a framework in which we can make assertions about an animal's affective state on the basis of the reinforcement value of preceding events. This, in turn, is essential for addressing challenge (iii); finding measures that reflect that state. Many such measures are now being investigated in animal welfare science and we argue that adopting the approach advocated here will help us to avoid circularity in interpreting findings and identifying those measures that best reflect the assumed state of the animal. The final challenge is the toughest – what exactly is it that we have measured? Following this approach, we can cogently argue that we have measured affective valence; a neurobehavioural state of relative 'positivity' or 'negativity'. However, can we go further and claim that our measures reflect the conscious experiences – feelings – implied by our everyday use of the word 'emotion'? If we accept that the problem of other minds cannot be solved, then the answer must be a behaviourist 'no'. If, on the other hand, we take a different philosophical stance, or we believe that we can gather enough evidence to argue by analogy that our study species shows sufficient similarities to humans to justify a claim for consciousness, then our answer may be 'yes'. Whichever is the case at present, new developments in the cognitive and neurosciences will bring us closer to answering this key question.

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Mike obtained a PhD in animal behaviour at Cambridge University in 1986. He then took a Royal Society European Research Fellowship to continue his work on behavioural development at Groningen University in the Netherlands, before returning to work at Cambridge University Vet School where he moved into the field of applied animal behaviour and welfare. He subsequently took up a position as a Behavioural Scientist at the Scottish Agricultural College in Edinburgh, continuing his work on pig behaviour and welfare, and then moved to Bristol University Vet School where he is now Professor of Animal Behaviour and Welfare, and has previously been Head of the Bristol Animal Welfare & Behaviour Group, and Deputy Head of School (Research). His current research interests are in the study of cognition, emotion, and social behaviour in domestic animals, with a view to using this information to improve animal welfare. Together with Dr Liz Paul, he developed a novel 'cognitive bias' approach to the assessment of animal emotions which draws on theory and findings from human psychology and cognitive neuroscience. He and
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Liz received the 2013 inaugural International Society for Applied Ethology Creativity Award, and the Alice Richie Trust Memorial Fund Award for their work in this area. Mike was awarded the UFAW Medal in 2014 for his contributions to animal welfare science, and the RSPCA/BSAS Award for Innovative Developments in Animal Welfare in 2015. Mike also works on more applied animal welfare issues, with current interests in the relationship between housing and husbandry procedures and the health and welfare of farm, laboratory and zoo animals, and chronic pain conditions in domestic dogs.

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Dr Tom Smulders
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'Can neuroscience offer new animal welfare measures?'

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At the core, the concept of animal welfare is based on the assumption that other animals can and do experience emotions and affect, just like humans do. Good welfare then, should involve minimizing the negative emotions experienced by the animals, and maximizing the positive emotions. The big problem, of course, is how to assess these emotions, especially in situations when they are not (or cannot be) expressed in overt behaviour patterns.

The brain structures that control emotions and affect are evolutionarily conserved across vertebrates. This makes it very likely that other vertebrates experience similar emotions to humans and that these are controlled in similar ways. Indeed, the whole field of pre-clinical research into psychiatric disorders is based on the assumption that emotional states akin to those of humans can be (at least partially) replicated in other mammalian species. I would argue that this assumption can be used in both directions, and that it should therefore be possible to make assumptions about the association between subjective states and neural processes in other animals from what we know about homologous situations in humans. Because the animals cannot express their subjective states to us, we should be able to use measurements of associated neural processes to make inferences about these subjective states.

In this presentation, I will briefly review what is known (and what is not yet known) about the neural basis of the experience of relevant emotional/affective states in the vertebrate brain. I will then discuss how this knowledge might be used to assess both immediate affective states in non-human animals and how it might be used to assess cumulative affective experience over longer periods of time. I will illustrate these points using my lab's first attempts at using such approaches in order to assess the experience of chronic stress in chickens and mice. Neuroscientific approaches to animal welfare measurement have the potential to be able to tap directly into the affective experiences of the animals in ways that would be impossible based on behaviour alone, but we have to be realistic about the practical situations in which these approaches can be used.

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Tom Smulders is Senior Lecturer in Evolutionary Neuroscience, and the Director of the Centre for Behaviour and Evolution, based in the Institute of Neuroscience at Newcastle University. He started his training as a Zoology student at Antwerp University in Belgium, and moved on to learn about Psychology and Neuroscience during his PhD at Cornell University in the USA. Throughout his career, his focus has been on brain evolution, both at large evolutionary scales (by comparing mammalian and avian brains) and at small scales (by studying differences in brain and behaviour between closely-related bird species). He takes a multi-faceted approach, which includes studying the selective pressures that lead to evolutionary changes in the brain, as well as the neural structures and functions that result from these selective pressures and the changes in behaviour these engender. His interests in the evolution of the hippocampus as a memory processor has recently led him to start investigating the role of the avian hippocampus in the regulation of the stress response, and as the location of potential biomarkers of chronic stress and hence poor welfare.
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