

**ANIMAL BOREDOM, EMOTION
AND PAIN: MAKING A LITTLE
SENSE OF THE SCIENCE FOR OUR
PATIENTS**

By: Stephen Cital RVT, RLAT, SRA, VTS-LAM



Essay

Bestial boredom: a biological perspective on animal boredom and suggestions for its scientific investigation



Charlotte C. Burn*

The Royal Veterinary College, North Mymms, Hertfordshire, U.K.

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Boredom is likely to have adaptive value in motivating exploration and learning, and many animals may possess the basic neurological mechanisms to support it. Chronic inescapable boredom can be extremely aversive, and understimulation can harm neural, cognitive and behavioural flexibility. Wild and domesticated animals are at particular risk in captivity, which is often spatially and temporally monotonous. Yet biological research into boredom has barely begun, despite having important implications for animal welfare, the evolution of motivation and cognition, and for human dysfunction at individual and societal levels. Here I aim to facilitate hypotheses about how monotony affects behaviour and physiology, so that boredom can be objectively studied by ethologists and other scientists. I cover valence (pleasantness) and arousal (wakefulness) qualities of boredom, because both can be measured, and I suggest boredom includes suboptimal arousal and aversion to monotony. Because the suboptimal arousal during boredom is aversive, individuals will resist low arousal. Thus, behavioural indicators of boredom will, seemingly paradoxically, include signs of increasing drowsiness, alongside bouts of restlessness, avoidance and sensation-seeking behaviour. Valence and arousal are not, however, sufficient to fully describe boredom. For example, human boredom is further characterized by a perception that time 'drags', and this effect of monotony on time perception can too be behaviourally assayed in animals. Sleep disruption and some abnormal behaviour may also be caused by boredom. Ethological research into this emotional phenomenon will deepen understanding of its causes, development, function and evolution, and will enable evidence-based interventions to mitigate human and animal boredom.

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Chronic inescapable boredom is neither trivial nor benign. In Charles Dickens's (1853) novel *Bleak House*, where the relatively modern word 'boredom' was coined, he described chronic boredom as 'desolation', a 'malady' and a 'monster'. Boredom is an unpleasant emotion including suboptimal arousal levels and a thwarted motivation to experience almost anything different or more arousing than the behaviours and sensations currently possible (adapted from Mason & Burn, 2011, in press). It arises when we perceive that there is 'nothing to do' or are 'tired of doing the same thing' (Larson & Richards, 1991), and is accompanied by a sense of time dragging (Didier-Weil, 1990; Droit-Volet & Meck, 2007; Wahidin, 2006). Fahlman, Mercer-Lynn, Flora, and Eastwood (2013) suggested boredom includes five components they labelled as Disengagement, High Arousal, Low Arousal, Inattention and Time Perception. Boredom differs from other related states

including frustration (Mason & Burn, 2011, in press), depression, stress and apathy (Goldberg, Eastwood, Laguardia, & Danckert, 2011). Inescapable boredom is highly distressing (Martin, Sadlo, & Stew, 2006), and a major torment for human prisoners (in both the U.S. and U.K.: Hunt, 2006, pp. 37–61; Wahidin, 2006). Human boredom can be triggered externally by monotonous, meaningless situations. This can cause work absenteeism, cognitive impairment, apathy (Harris, 2000), risk taking, alcoholism (Wegner & Flisher, 2009) and abnormal behaviours (such as head banging or rocking; Mendez & Mirela, 1998). Similarly, boredom proneness exists as a personality trait, predictive of addiction, aggression, depression, impulsivity, sensation seeking, dangerous driving and juvenile delinquency (Dahlen, Martin, Ragan, & Kuhlman, 2005; Harris, 2000; Mercer-Lynn, Flora, Fahlman, & Eastwood, 2013; Newberry & Duncan, 2001). Toohey (2011, page 1) suggested 'Predictability, monotony and confinement are all key' to triggering boredom. Although he was mostly writing about human boredom, these three factors typify captive life for nonhuman animals, so boredom could be a prevalent and chronic animal welfare problem (Mason & Burn, 2011; Wemelsfelder, 2005). Boredom is socially and

* Correspondence: C. C. Burn, The Royal Veterinary College, North Mymms AL9 7TA, U.K.
 E-mail address: charlotte.burn@worc.oxon.org.

Constructing nonhuman animal emotion

Eliza Bliss-Moreau

Scientists and lay-people alike have long been fascinated with the emotional lives of nonhuman animals. To date, scientific approaches to the study of 'animal' emotion have assumed that emotions are biologically evolutionarily conserved, hardwired and have discrete behavioral and physiological outputs. According to this view, emotions and their outputs are homologous across species, allowing humans to accurately perceive (or 'read') animal emotion using our own concepts of what emotions are. In this paper, I discuss the challenges to that perspective and propose using an alternative theoretical approach to understand animal emotion. Adopting this alternative approach, which represents a collection of similar theories (referred to as 'Theories of Constructed Emotion'), changes the questions that we ask about animal emotion, how we study emotion across phylogeny and advance translational science, and how we understand the evolution of emotion.

Address

Department of Psychology, California National Primate Research Center, University of California, Davis, Davis, CA 95616, USA

Corresponding author: Bliss-Moreau, Eliza (ebblissmoreau@ucdavis.edu)

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The idea that a small set of emotions is biologically hardwired, evolutionarily conserved, and has discrete and specific behavioral and biological outputs has dominated the study of affect in human and nonhuman animals (herein, 'animals') [1*,2–7]. This 'Classic View of Emotion' (CVE) is intrinsically appealing, most notably because it stipulates that it is possible to understand animals' emotions by measuring behavioral and biological outputs and categorizing them into human emotion categories (e.g. freezing equals fear). This approach, however, is problematic for several reasons. In the present paper, I review the problems inherent with the CVE for studying animal emotion and introduce a set of emotion theories collectively known as Theories of Constructed Emotion (TCE; for reviews: [8,9**]) as an alternative framework for understanding the affective lives of nonhuman animals and the evolution of emotion.

Challenges to the Classic View of Emotion as a model for animal emotion

The primary problem associated with applying CVE to animals is that it assumes that there must be consistent, discrete, and specific markers of emotions — each emotion must have a distinct and reproducible signature of behavior, physiology, or both. However, such signatures do not exist in humans. While some individual studies have found evidence of mappings between emotions and outputs, meta-analyses, which provide a comprehensive gestalt view of the entire literature do not. The correspondence between outputs and emotions does not exist in humans in the autonomic nervous system [10–13], the central nervous system [14*,15–18], or facial behavior [10,19]. Variation in human emotion outputs is the norm and not the exception. The only way to know with confidence what emotion a human is experiencing is to ask him to report on his state using symbols (words). Such reports are impossible for most, if not all, animals.

Potent human beliefs about the realness of our emotional experience and perception of emotions in others reflect the remarkable capacity of humans to use conceptual knowledge and to infer mental states ([20] for a recent review on mental inference). Inferring emotion in animals based on our perception does not ensure that animals have those emotions (for a similar argument [21**,22**]). Our human perceptions are real. But, the realness of our perceptions does not confer realness of the animals' experience. Thousands of years of human history demonstrate that how humans perceive the world does not necessarily reveal the reality of the world — for example, the earth is not flat and the sun does not orbit around the earth. It may be argued that the case of emotions is no different. When human emotion concepts are applied to animals we are engaging in human perception and mental inference — not data collection. Perception of emotion in animals is the act of 'seeing human' where it may or may not be.

Theories of Constructed Emotion as a model for animal emotion

Given the variation in the manifestation of emotions in humans (i.e. there are not consistent mappings^a between outputs and emotions) and that seeing emotion in animals reflects the human capacity for mental inference and not (necessarily) animals' capacity for emotion, an alternative approach to the study of animal emotion is clearly warranted. TCE provide a promising alternative. While

^a Even if one argues that the evidence for mappings requires more data or better methods, the logical choice is to not assume that emotions exist in other animals, but to adopt an approach that does not require such assumptions until evidence is found.



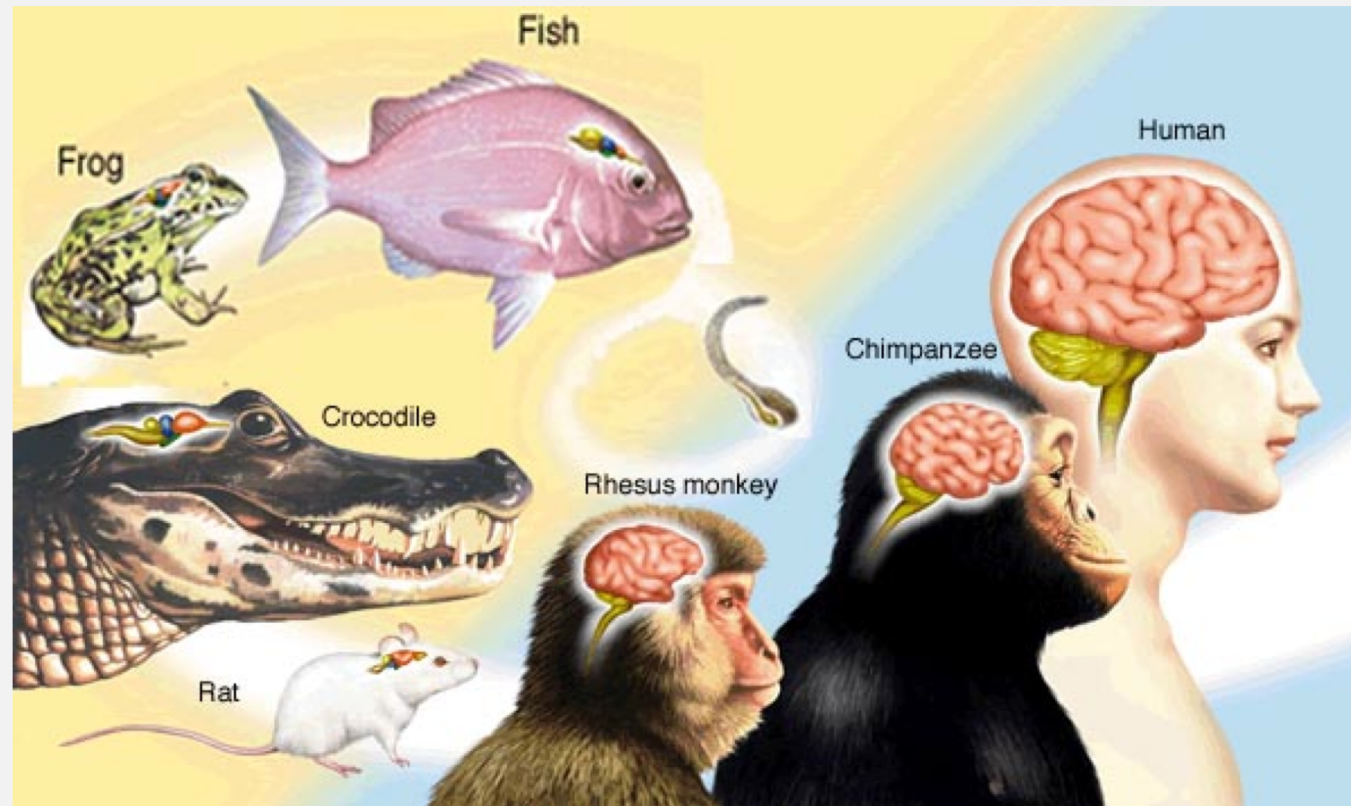


CONSCIOUSNESS

- as defined by human researchers

- 1) Sustained awareness of the environment in a way that is appropriate and meaningful
- 2) Ability to follow commands and perform novel actions
- 3) Ability to communicate (verbal or non-verbal) indicating awareness of ongoing interactions

COMPARATIVE ANATOMY THE BRAIN





Donald F Egan Scientific Memorial Lecture

The Physiology of Dinosaurs: Circulatory and Respiratory Function in the Largest Animals Ever to Walk the Earth

David J Pierson MD FAARC

Introduction: Why Dinosaurs?

How Can We Know Anything About the Physiology of Dinosaurs?

Circulation: How Could the Tallest Dinosaurs Have Perfused Their Brains?

Systemic Blood Pressures in the Largest Sauropods

Warm-Blooded, Cold-Blooded, or Both?

Structure of the Dinosaur Heart

Summary: Circulation

Respiration: How Could They Have Breathed Through Such Long Necks?

Snorkel Breathing

Lessons From the Giraffe



Vet Clin North Am Exot Anim Pract. 2011 Jan;14(1):45-60. doi: 10.1016/j.cvex.2010.09.009.

Pain and nociception in reptiles.

Mosley C¹.

Author information

Abstract

The ability of reptiles to "feel" pain and the significance of pain or nociception on physiologic homeostasis is an exceedingly complex question requiring integration of both physiologic and behavioral evidence. Until further information is available, it would seem most ethical for veterinarians to assume that reptiles are capable of feeling pain, and to treat or manage pain when there is reasonable evidence that pain is present. With increased information available regarding analgesic use in reptiles and with the heightened awareness of the importance of analgesia for zoologic companion animals, it is likely that more veterinarians will provide pain relief to their reptile patients.

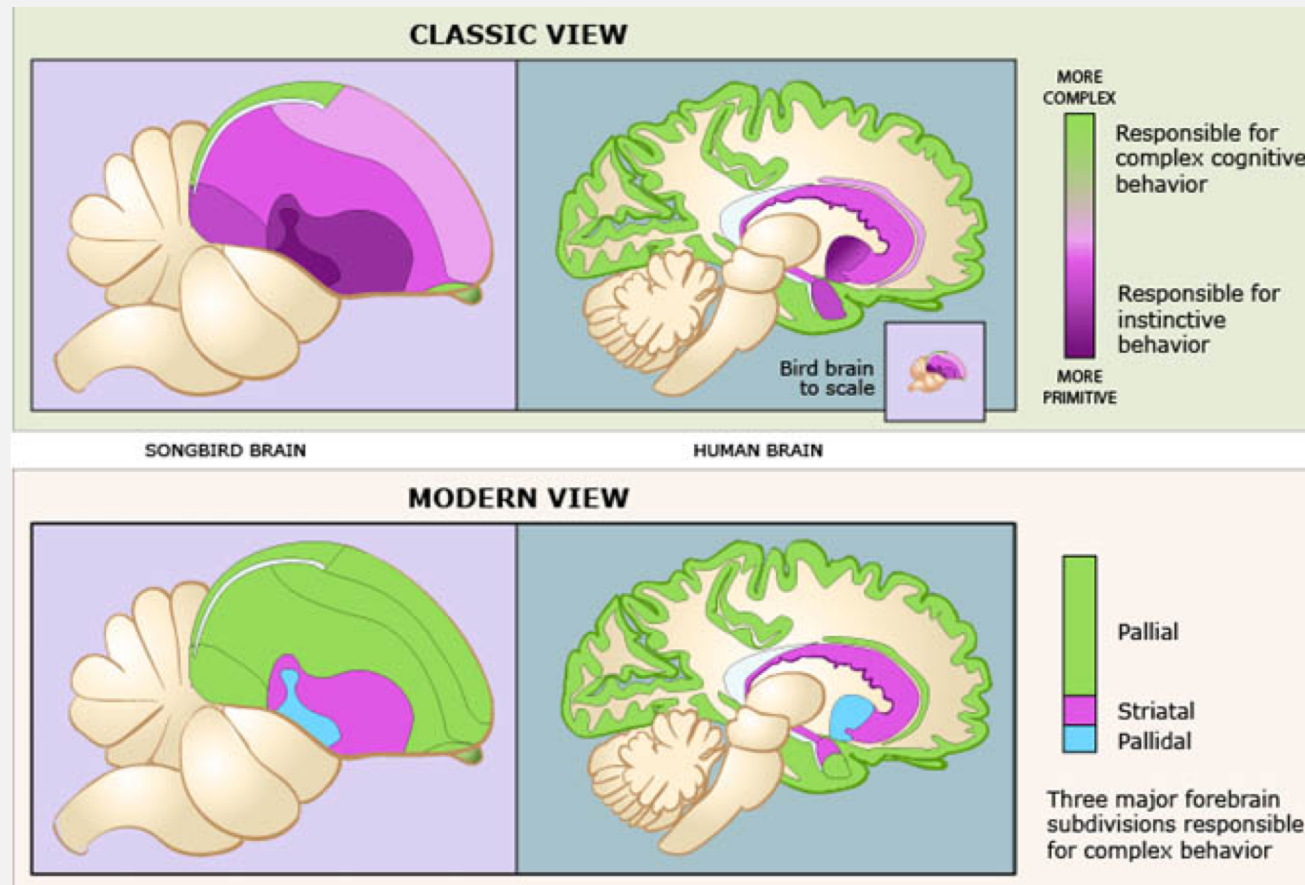
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[Indexed for MEDLINE]

in humans. We evaluate recent claims for consciousness in fishes, but find these claims lack adequate supporting evidence, neurological feasibility, or the likelihood that consciousness would be adaptive. Even if fishes were conscious, it is unwarranted to assume that they possess a human-like capacity for pain. Overall, the behavioral and neurobiological evidence reviewed shows fish responses to nociceptive stimuli are limited and fishes are unlikely to experience pain.

THE OLD WAY AND THE NEW

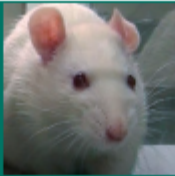



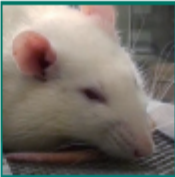
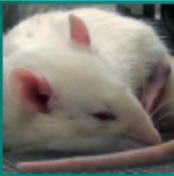


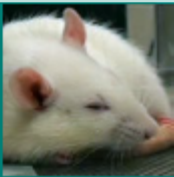
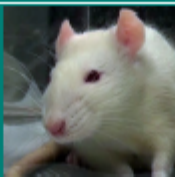
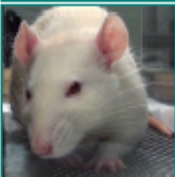



The Rat Grimace Scale

Research has demonstrated that changes in facial expression provide a means of assessing pain in rats.

The specific facial action units shown below have been used to generate the Rat Grimace Scale. These action units increase in intensity in response to post-procedural pain and can be used as part of a clinical assessment.

The action units should only be used in awake animals. Each animal should be observed for a short period of time to avoid scoring brief changes in facial expression that are unrelated to the animal's welfare.

	Not present "0"	Moderately present "1"	Obviously present "2"
Orbital tightening <ul style="list-style-type: none"> Closing of the eyelid (narrowing of orbital area) A wrinkle may be visible around the eye 			
Nose/cheek flattening <ul style="list-style-type: none"> Flattening and elongation of the bridge of the nose Flattening of the cheeks (potentially sunken look) 			
Ear changes <ul style="list-style-type: none"> Ears curl backwards and are angled forward to form a 'pointed' shape Space between the ears increases 			
Whisker change <ul style="list-style-type: none"> Whiskers stiffen and angle along the face Whiskers may 'clump' together Whiskers lose their natural 'downward' curve 			

Read the original paper:
Buitrago MM, Borsoi RE, Zalcman A, Tittle AK, Marsh LJ, Wessely JF, Mappalanki JCB, Wolf P, Zhai S, Zhang B, McDougall JJ, King OD, McGill JS. 2011. The Rat Grimace Scale: a partially automated method for quantifying pain in the laboratory rat via facial expressions. *Molecular Pain* 7:35. doi:10.1186/1744-0069-7-35

For guidance on using the Rat Grimace Scale, research papers that describe this technique, and for grimace scales in other species, visit www.nc3rs.org.uk/grimacescales. To request copies of this poster, please email enquiries@nc3rs.org.uk. The NC3Rs provides a range of 3Rs resources at www.nc3rs.org.uk/resources.

Images kindly provided by Dr Jeffrey McGill, McGill University

Behavioural and neurophysiological evidence for face identity and face emotion processing in animals

Andrew J. Tate, Hanno Fischer, Andrea E. Leigh and Keith M. Kendrick*

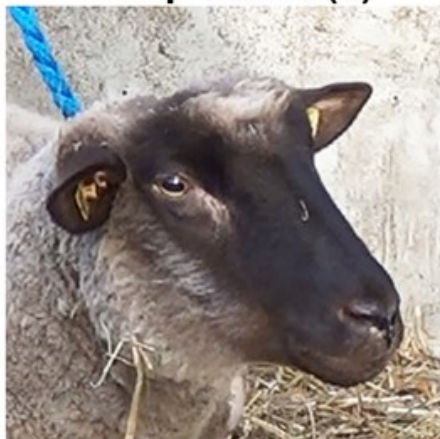
Cognitive and Behavioural Neuroscience, Babraham Institute, Babraham, Cambridge CB2 4AT, UK

Visual cues from faces provide important social information relating to individual identity, sexual attraction and emotional state. Behavioural and neurophysiological studies on both monkeys and sheep have shown that specialized skills and neural systems for processing these complex cues to guide behaviour have evolved in a number of mammals and are not present exclusively in humans. Indeed, there are remarkable similarities in the ways that faces are processed by the brain in humans and other mammalian species. While human studies with brain imaging and gross neurophysiological recording approaches have revealed global aspects of the face-processing network, they cannot investigate how information is encoded by specific neural networks. Single neuron electrophysiological recording approaches in both monkeys and sheep have, however, provided some insights into the neural encoding principles involved and, particularly, the presence of a remarkable degree of high-level encoding even at the level of a specific face. Recent developments that allow simultaneous recordings to be made from many hundreds of individual neurons are also beginning to reveal evidence for global aspects of a population-based code. This review will summarize what we have learned so far from these animal-based studies about the way the mammalian brain processes the faces and the emotions they can communicate, as well as associated capacities such as how identity and emotion cues are dissociated and how face imagery might be generated. It will also try to highlight what questions and advances in knowledge still challenge us in order to provide a complete understanding of just how brain networks perform this complex and important social recognition task.

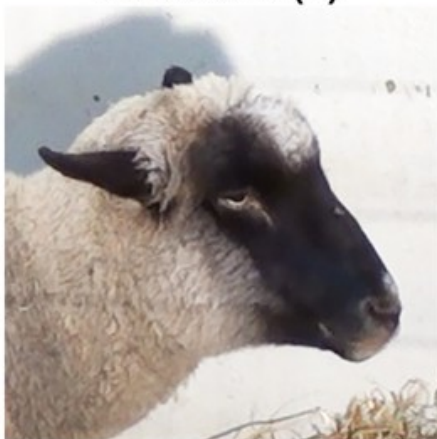
Keywords: face recognition; face emotion; face imagery; neural encoding; temporal cortex

Orbital tightening

Not present (0)



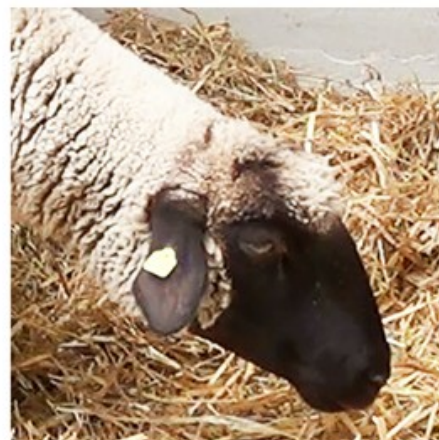
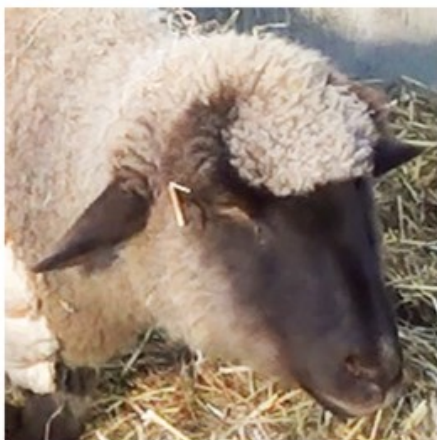
Moderate (1)



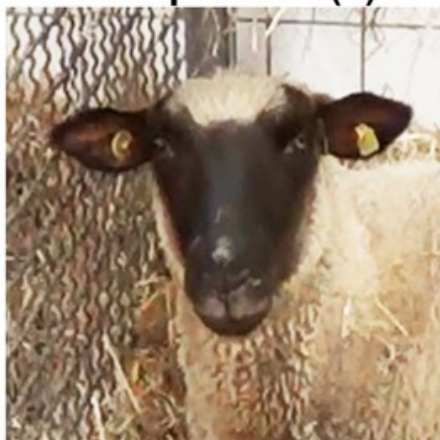
Severe (2)



Ear & head position



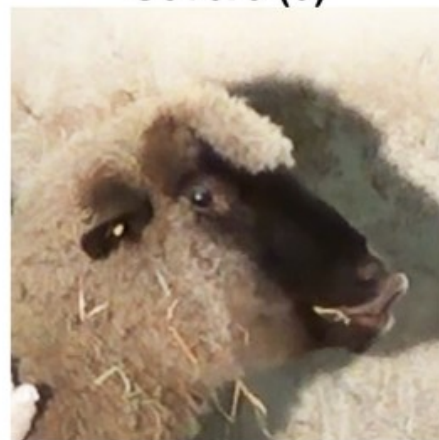
Not present (0)



Moderate (1)



Severe (3)



Flehming

THEORY OF MIND

Theory of mind in dogs? Examining method and concept

Alexandra Horowitz

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Abstract In line with other research, Udell, Dorey, and Wynne's (in press) finding that dogs and wolves pass on some trials of a putative theory-of-mind test and fail on others is as informative about the methods and concepts of the research as about the subjects. This commentary expands on these points. The intertrial differences in the target article demonstrate how critical the choice of cues is in experimental design; the intersubject-group differences demonstrate how life histories can interact with experimental design. Even the best-designed theory-of-mind tests have intractable logical problems. Finally, these and previous research results call for the introduction of an intermediate stage of ability, a *rudimentary* theory of mind, to describe subjects' performance.

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'Theory of mind' in animals: ways to make progress

Elske van der Vaart · Charlotte K. Hemelrijk

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Abstract Whether any non-human animal can attribute mental states to others remains the subject of extensive debate. This despite the fact that several species have behaved as if they have a 'theory of mind' in various behavioral tasks. In this paper, we review the reasons of skeptics for their doubts: That existing experimental setups cannot distinguish between 'mind readers' and 'behavior readers', that results that seem to indicate 'theory of mind' may come from studies that are insufficiently controlled, and that our own intuitive biases may lead us to interpret behavior more 'cognitively' than is necessary. The merits of each claim and suggested solution are weighed. The conclusion is that while it is *true* that existing setups cannot conclusively demonstrate 'theory of mind' in non-human animals, focusing on this fact is unlikely to be productive. Instead, the more interesting question is how *sophisticated*







Research Article

Cooccurrence of Yawning and Stereotypic Behaviour in Horses (*Equus caballus*)

**Carole Fureix,¹ Aleksandra Gorecka-Bruzda,²
Emmanuel Gautier,¹ and Martine Hausberger¹**

¹UMR CNRS 6552 Ethologie Animale et Humaine, Université de Rennes 1, Campus de Beaulieu Bâtiment 25,
263 avenue du Général Leclerc, 35042 Rennes Cedex, France

²Department of Animal Behaviour, Institute of Genetics and Animal Breeding, Polish Academy of Sciences,
Jastrzebiec, Postępu 1, 05 552 Wolka Kosowska, Poland

Correspondence should be addressed to Carole Fureix, carole.fureix@univ-rennes1.fr

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Determinants of yawning are still uncertain. As yawning seems to be triggered by stress and emotional contexts, we investigated specific correlates of yawning and stereotypic behaviours in horses. Study 1 investigated correlations in time between yawning and stereotypic behaviour in stereotypic horses from the same facility; study 2, involving riding school horses, investigated the cooccurrence of yawning and stereotypic behaviour at the individual level and in response to environmental factors (feeding time). Results showed that (1) stereotypic horses yawned more than the nonstereotypic horses, (2) yawning increased at the same time periods as stereotypic behaviours did, and (3) yawning frequency was positively correlated with stereotypic behaviour frequencies (study1). Different hypotheses are discussed: direct/indirect causal relationship and other factors susceptible to trigger both yawning and stereotypies. This study, underlining for the first time a cooccurrence of yawning and stereotypic behaviour, opens a promising line of investigation of this puzzling behaviour.



Research Article

Meta-Analytic Review of the Effects of Enrichment on Stereotypic Behavior in Zoo Mammals

Amanda Shyne*

Department of Psychology, Northeastern University, Boston, Massachusetts

This meta-analysis reports the effect enrichment has on the occurrence of stereotypic behavior exhibited by captive zoo mammals. The analysis also identifies which types of enrichment are most effective, which groups of animals benefit the most, and which types of stereotypes are most affected by environmental enrichment. The analysis included 54 studies that yielded 63 effect size statistics. Fifty-seven of sixty-three effect sizes went in the predicted direction (90%), with the animals participating in less stereotypic behavior during the enrichment condition than in the baseline condition. The mean effect size (correlation coefficient r) was 0.46. The combined P -value using both fixed and random effects methods was revealed to be <0.0000001 . A file drawer N -value was calculated to identify the number of unretrieved studies (with a combined effect size of zero) that would be needed to nullify the results of this analysis. The file drawer N -value was 1,726, suggesting that it is highly unlikely that the significant results reported in this analysis are nullified by studies that remain in file drawers. Based on these results it was concluded that enrichment substantially reduces the frequency of stereotypic behavior exhibited by mammals living in zoo environments. Zoo Biol 25:317–337, 2006. © 2006 Wiley-Liss, Inc.

Keywords: environmental enrichment; animals; stereotypes; captivity



SELF-RECOGNITION

Mirror tests

- Elephants
- Magpies
- Ravens
- Dolphins (Orca whales)
- Ants
- Great Apes
- Manta Rays (?)

COMPLEX SOCIAL BEHAVIOR

- Competition (Power)
- Cooperation (Playing)
- Compassion (Empathy)
 - “Morality” (?)
 - Consolation
- Reciprocity
- Reconciliation





Behavioural Processes 60 (2002) 165–180

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Emotions in farm animals: a new approach to animal welfare in applied ethology

Lara Désiré, Alain Boissy*, Isabelle Veissier

Unité de Recherche sur les Herbivores, INRA Clermont-Ferrand/Theix, F-63122 Saint-Genès-Champanelle, France

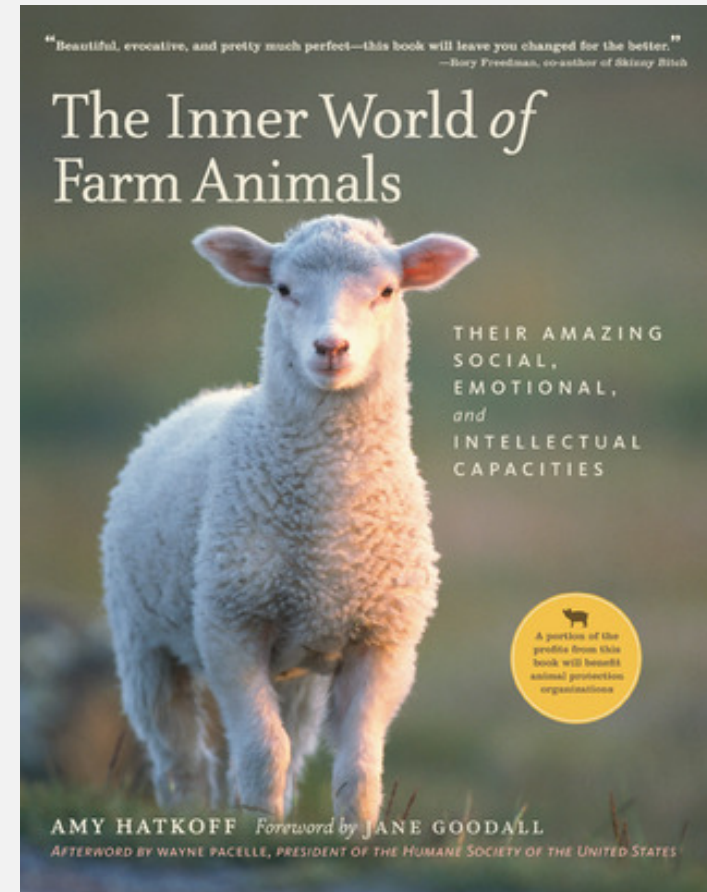
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Abstract

One of the major topics of applied ethology is the welfare of animals reared by humans. Welfare can be defined as a state of harmony between an individual and its environment. Any marked deviation from this state, if perceived by the individual, results in a welfare deficit due to negative emotional experiences. In humans, verbal language helps to assess emotional experiences. In animals, only behavioural and physiological measurements help to detect emotions. However, how to interpret these responses in terms of emotional experiences remains an open question. The information on the cognitive abilities of farm animals, which are available but scattered, could help the understanding of their emotions. We propose a behavioural approach based on cognitive psychology: emotions can be investigated in farm animals in terms of the individual's appraisal of the situation. This evaluative process depends on: (a) the intrinsic characteristics of the eliciting event (suddenness, novelty, pleasantness); (b) the degree of conflict of that event with the individual's needs or expectations; and (c) the individual's coping possibilities offered by the environment. The result of such an evaluation determines the negative versus positive emotions. We propose an analysis of the emotional repertoire of farm animals in terms of the relationship between the evaluative process of the event on the one hand and the behavioural and physiological responses on the other hand.

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Keywords: Cognition; Emotion; Farm animal; Welfare











Reviews

Animal play and animal welfare

Suzanne D. E. Held^{a,*}, Marek Špinka^{b,1}^a Centre for Behavioural Biology, Department of Clinical Veterinary Science, University of Bristol^b Department of Ethology, Institute of Animal Science in Prague

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Play has long been identified as a potential welfare indicator because it often disappears when animals are under fitness challenge and because it is thought to be accompanied by a pleasurable emotional experience. But animal play is a vexing behavioural phenomenon, characteristically flexible and variable within and between species, with its proximate mechanisms and ultimate functions still not fully understood. Its relationship to animal welfare is therefore complex and merits a focused theoretical investigation. We review evidence on four aspects of the play–welfare relationship: first, that play indicates the absence of fitness threats; second, that play acts as a reward and flags up the presence of opioid-mediated pleasurable emotional experiences; third, that play brings immediate psychological benefits and long-term fitness and health benefits, and thus improves current and future welfare; and finally, that play is socially contagious and therefore capable of spreading good welfare in groups. On this basis, we argue that play does indeed hold promise as a welfare indicator and also as a tool to improve it; but we also point to difficulties in its study and interpretation, and identify some unresolved questions. As a welfare indicator, play may signal both the absence of bad welfare and the presence of good welfare, thus covering a wide range of the welfare spectrum. However, play can also increase in stressful situations, in response to reduced parental care, or as a rebound after a period of deprivation and therefore does not consistently reflect favourable environmental conditions. A better fundamental understanding is needed of the varied ultimate functions and proximate mechanisms of play, and the species-specific play patterns of captive animals, in order to be able to explain exactly what an animal's play behaviour tells us about its welfare state, and whether and how play might be applied as a tool to improve welfare. © 2011 The Association for the Study of Animal Behaviour. Published by Elsevier Ltd. All rights reserved.

To suggest a relationship between the play behaviour of animals and their welfare is hardly novel. Play has long been identified as a potential indicator of the current welfare state of an animal (e.g. Fagen 1981; Lawrence 1987). It is easy to recognize, present in a wide array of mammals and can be measured noninvasively (Fraser & Duncan 1998; Špinka et al. 2001; Barnard 2004; for other taxa see Fagen 1981; Burghardt 2005); it is often expressed in the absence of fitness threats and can drop out of the behavioural repertoire when conditions become more challenging (Lawrence 1987; Fraser & Duncan 1998; Špinka et al. 2001; Dawkins 2006); it is also commonly linked to the experience of positive emotions in animals (Fraser & Duncan 1998; Špinka et al. 2001; Barnard 2004; Burgdorf & Panksepp 2006) as it has long been in humans (e.g. Clark & Miller 1998). In human children, for example, play inhibition is one of the core symptoms of depression, both in

standardized play tests and in free play situations (Lous et al. 2002). The most recent review of positive emotions in the context of animal welfare assessment therefore singled out play behaviour as one of the three most promising indicators of positive emotions in captive (to include 'domestic') animals (Boissy et al. 2007). Play behaviour thus appears to have the potential to flag up challenging conditions, in which an animal's welfare may be compromised, as well as favourable situations, which induce positive emotions and good welfare. Furthermore, playing can have immediate, delayed and/or long-term benefits and thus cause welfare improvements, not just reflect them. Yet a systematic theoretical or experimental investigation of the relationship between animal play and animal welfare is lacking. The main purpose of this review therefore is to provide a theoretical analysis of how an animal's play behaviour relates to its welfare. Within this, we put the case that play can not only result from good welfare but also cause it.

Defining 'play' is difficult because it covers many behavioural categories, varies considerably between and within species, and its single or multiple functional significance is still being debated (e.g. Bekoff & Byers 1998; Power 2000; Špinka et al. 2001; Burghardt 2005). In the absence of a widely agreed functional or structural

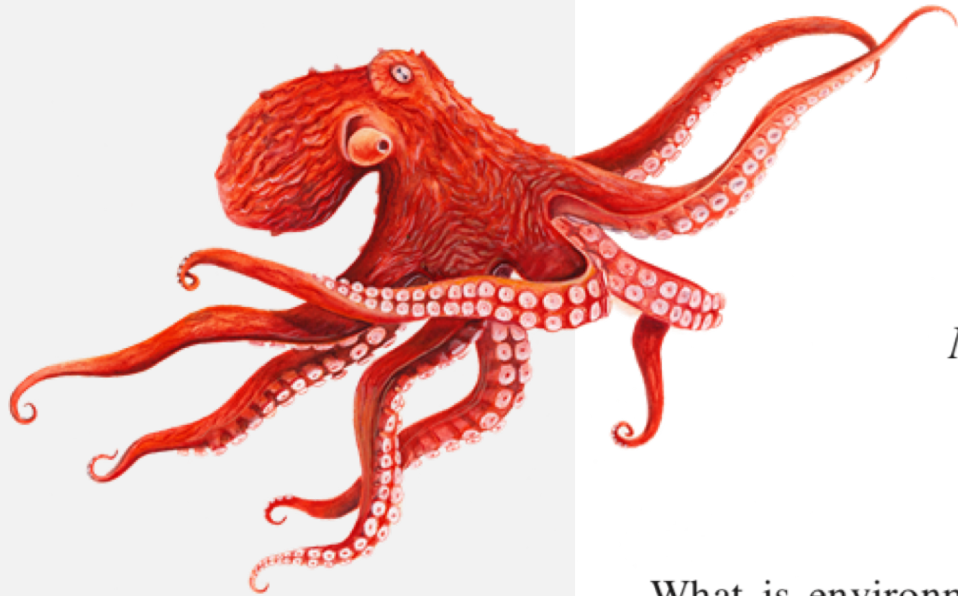
* Correspondence: S. D. E. Held, Department of Clinical Veterinary Science, University of Bristol, Langford BS40 5DU, U.K.

E-mail address: suzanne.held@bris.ac.uk (S. D. E. Held).

¹ M. Špinka is at the Research Institute of Animal Production, Pratelství 815, Prague-Uhřetíněves 104 00, Czech Republic.



Enrichment for Giant Pacific Octopuses: Happy as a Clam?



Roland C. Anderson
The Seattle Aquarium

James B. Wood
*National Resource Center for Cephalopods
University of Texas*

What is environmental enrichment? During the last several decades, zoos and aquariums have come to realize (perhaps belatedly) that animals kept in captivity need environmental enrichment for their well-being (Seidensticher & Forthman, 1998). Early zoos and aquariums tried to show as many animals as possible; hence, their exhibits were frequently small and bare to permit easy viewing, cleaning, and sterilization. Now, all have come to realize that captive animals need environmental enrichment for their health and for the education and increased expectations of visitors to zoos and aquariums.

Animal Suffering: An Invertebrate Perspective

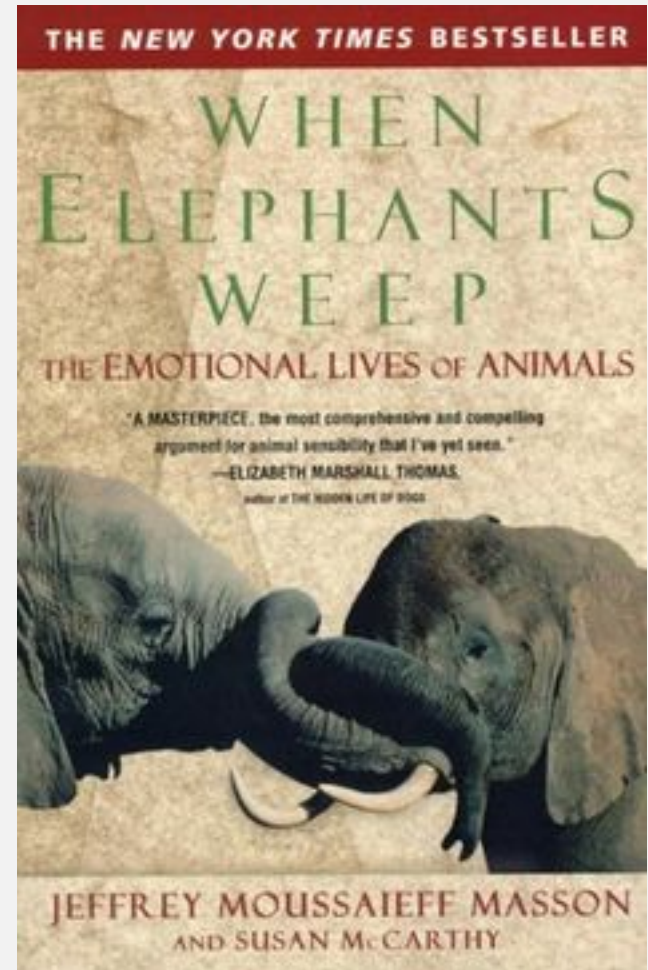
Jennifer A. Mather

*Department of Psychology and Neuroscience
The University of Lethbridge, Canada*



Consideration of the welfare of other animals often is anthropocentric, focusing usually on mammals similar to humans. This article argues the necessity of evaluating the extension of such consideration more widely to invertebrates. Although unlike humans, some groups such as cephalopod molluscs probably have the potential for pain and suffering. In addition, a morality of care, rather than one of rights, and the damage humans do to themselves by cruel treatment of animals both argue for the extension of consideration to all animal species. This consideration predicts extension of basic care of cephalopods from simple housing and feeding into areas such as behavioral enrichment.

When it comes to evaluating suffering of nonhuman animals or considering how to provide them with appropriate care, it can be argued that we humans are quite anthropocentric. Basically, and not surprising, we see the world in terms of us. We have a complex series of regulations that control our management of research animals (Olfert, Cross, & McWilliam, 1993), but it is nearly all about vertebrates and, in particular, mammals. In the West, and particularly in science, we emphasize morality as rights and justice (Hinman, 1998) and extend consideration to animals similar to us. So where does that leave my octopuses? Certainly, they are nothing like us. In fact, they belong to a branch of the molluscs, the cephalopods, and are far more closely related to boring clams than to intelligent monkeys or cats. Yet, grounds for extending some ethical consideration to octopuses come from their well-known intelligence (Hanlon & Messenger, 1996; Mather, 1996; Mather & Anderson, 2000). Because they have the sensory ability, memory capacity, and range of responses expected of





Animal Behavior: Conflict Management Is for the Birds

Conflict is a fact of life in social species. New data from birds enhance our understanding of how and why evolution has favored mechanisms to resolve disputes and manage conflicts.

Joan B. Silk

In many mammalian species, including our own, sociality is the norm. Animals may be better off in groups because they are safer from predators, better able to defend food resources, or profit from sharing information. But these advantages do not necessarily produce social harmony. Noisy squabbles over food, mating opportunities, grooming partners, maternal attention, resting spots and social status punctuate the day. Clearly, animals that depend on being together may need some help in getting along.

A growing body of evidence from an increasing range of animal taxa suggests that evolution has provided animals with behavioral tools to resolve conflicts [1]. For example, after two female baboons fight, the winner may approach the

other members of their flocks. When this happens, rooks do not reconcile with their former opponents.

The absence of reconciliation in rooks provides some insight about its function. In monkeys, conflict is evidently stressful. After monkeys fight, their heart rates rise and remain elevated for several minutes. If monkeys reconcile, their heart rates return to baseline levels more quickly than they otherwise would do [9]. Conflict may also have long term effects on the quality of social bonds. Following the lead of Frans de Waal and colleagues [10], most researchers have embraced the idea that reconciliation helps former opponents to repair valuable social relationships that have been disrupted by conflict. The importance of these relationships favors mechanisms to preserve

Although this explanation for reconciliation seems intuitively appealing, it is not clear that it is correct. We do not have compelling evidence that conflict has negative long-term effects on social bonds in primates or other taxa, or that reconciliation is needed to maintain close bonds. In fact, rates of conflict are often quite high among pairs of females who have very strong bonds, such as sisters. We also know that the same pairs

of monkeys fight over and over again. It is reasonable that reconciliation would occur after repeated offenses. However, if monkeys have very strong bonds, they are often very forgiving and reconciliation seems very plausible.

It is possible that reconciliation is a gesture, like the lip-lick or the chimpanzee hug, that is more like a cease-fire or armistice. These are not predictive signals that the caller does not intend to resume the conflict. Reconciliation may be useful because it provides clear beginnings, but ambiguous endings. Whether a relationship is up again is thought



Effect of environmental enrichment on escalation of cocaine self-administration in rats

Cassandra D. Gipson · Joshua S. Beckmann ·
Shady El-Maraghi · Julie A. Marusich ·
Michael T. Bardo

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Abstract

Background Previous studies found that environmental enrichment protects against the initiation of stimulant self-administration in rats, but it is unclear if enrichment also protects against the escalation of stimulant use with long-term exposure.

Objective The current study examined the effects of environmental enrichment on escalation of cocaine self-administration using an extended access procedure.

Methods Rats were raised from 21 days in an enriched condition (EC) with social cohorts and novel objects, a social condition with only social cohorts (SC), a novelty condition (NC) with novel objects in isolated cages, or an isolated condition (IC) without social cohorts or novel objects. In young adulthood, EC, SC, NC, and IC rats were separated into short access (ShA) or long access (LgA) groups that received either 1 or 6 h, respectively, of daily cocaine self-administration (0.1 mg/kg/infusion) for 14 days. In a second experiment, EC and IC rats were

doses; however, with extended training, both groups eventually reached similar rates. At the 0.1 mg/kg/infusion dose, only NC and IC rats escalated in amount of intake when switched to the LgA sessions. At the 0.5 mg/kg/infusion dose, rates of cocaine self-administration escalated in LgA groups over 14 days regardless of EC or IC rearing condition; however, EC rats escalated at a faster rate, eventually reaching the same level of intake observed in IC rats.

Conclusions Although environmental enrichment protects against escalation of a low unit dose of cocaine, it may not protect against escalation with a higher unit dose. In addition, at a lower unit dose, this protective mechanism appears to be due to the presence of social cohorts rather than novel objects.

Keywords Environmental enrichment · Escalation · Cocaine · Addiction

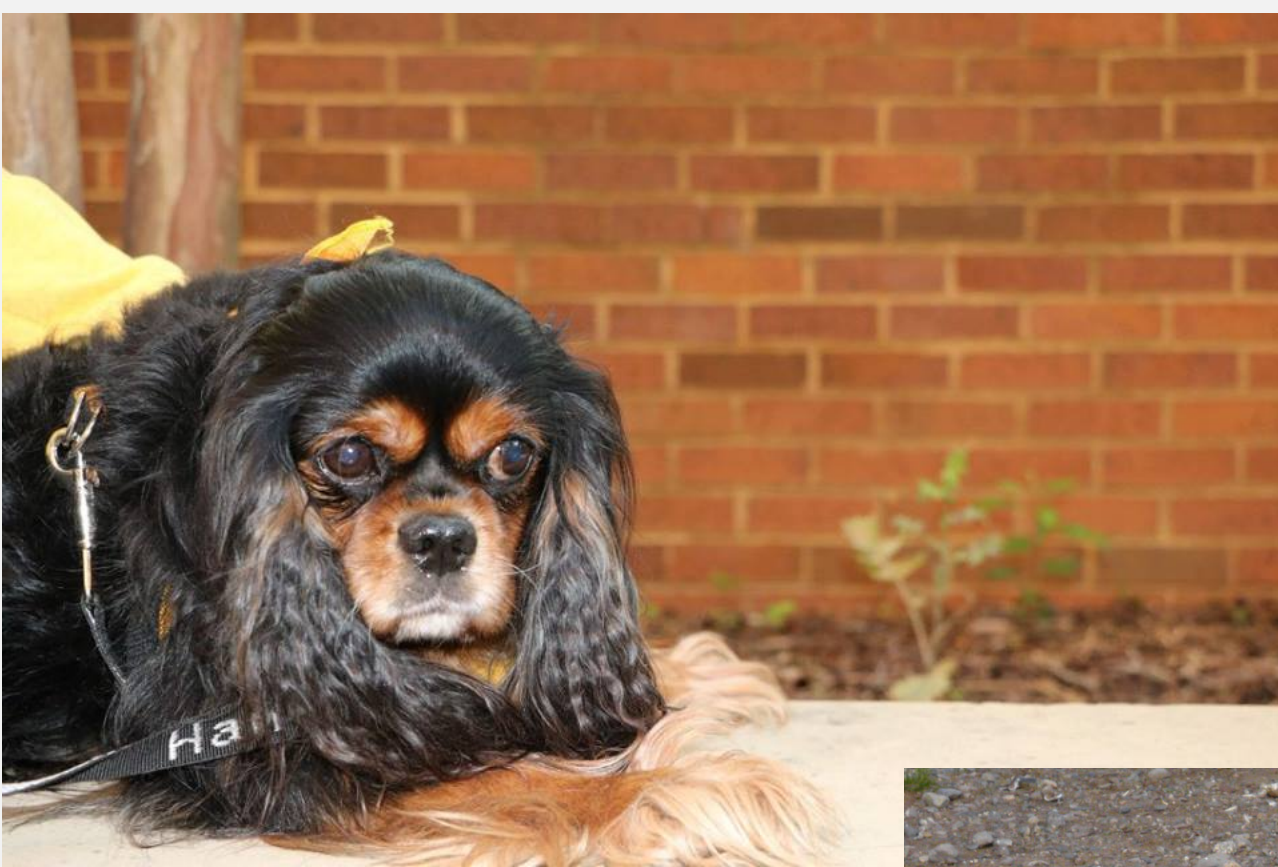
Effects of Environmental Enrichment on Voluntary Ethanol Intake in Rats

GARY E. ROCKMAN, JAMES E. M. GIBSON AND AL BENARROCH

Department of Psychology, University of Winnipeg, Winnipeg, Manitoba, Canada, R3B 2E9

Received 25 January 1989

ROCKMAN, G. E., J. E. M. GIBSON AND A. BENARROCH. *Effects of environmental enrichment on voluntary ethanol intake in rats.* PHARMACOL BIOCHEM BEHAV 34(3): 487–490, 1989.—The effects of exposure to four environmental rearing conditions on subsequent voluntary ethanol intake were examined. Male weanling rats were reared in either an enriched environment or individually for 90 days. After the 90-day environmental exposure period, the two initial groups (Enriched and Isolated) were randomly subdivided into four groups (Enriched, Enriched/Isolated, Isolated, and Isolated/Enriched) and exposed to increasing concentrations of ethanol (3% to 9% v/v) in a free choice with water. Therefore, half the animals raised in the enriched environment were permanently placed into individual cages (Enriched/Isolated) for the remainder of the study. Likewise, half of the animals previously reared individually were exposed daily (0900–1700) to the enriched environment (Isolated/Enriched). Results indicated that the enriched animals consumed greater amounts of ethanol as compared to all other groups. In contrast, rats placed in isolation following 90 days of enrichment demonstrated significant reductions in voluntary ethanol intake. The data suggest that rearing in an enriched environment for 90 days and continued exposure following 111 days of age, are necessary to enhance voluntary ethanol consumption.





I pooped in Holly's
slippers while she was
on holiday...
and I'm not sorry.

GRACIAS

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