Negative affective states and their effects on morbidity, mortality and longevity

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Abstract

Mortality rates are often used in population-level animal welfare assessments because they are assumed to reflect rates of disease or injury and other problems likely to cause poor welfare. High mortality is thus assumed to correlate with factors likely to cause negative affective states. Here, we argue that negative affective states are also related to mortality rates more directly, via causal rather than merely correlational routes. In humans, negative affective states predict elevated morbidity and mortality rates as well as decreased longevity, while self-reported happiness does the opposite. This review investigates whether mortality rates and longevity can thus be used to make inferences regarding past affective states in animals. The proposed mechanism is that chronic stressors cause negative affective states and thence harmful physiological consequences through continual activation of the hypothalamic-pituitary-adrenal and sympathetic-adreno-medullary axes, which in turn can lead to increased mortality. The convergent validity of mortality as an indicator of past negative affect is demonstrated via examples of how stressors such as bereavement in humans and social isolation in social non-human species cause negative affective states, and then increase the morbidity of potentially lethal conditions such as cardiovascular disease, cancer and HIV/AIDS, ultimately leading to increased mortality and reduced longevity in both humans and animals. The potential drawbacks of using mortality rates to infer animal welfare are also discussed, including its low sensitivity and the multiplicity of factors unrelated to affective states that can influence mortality rates. However, providing these issues are accounted for, it is suggested that this indicator has value in welfare assessment, and is especially well suited for cases where animals are allowed to live out their natural lifespans, such as tends to be the case with zoo and companion animals.

Keywords: animal welfare, longevity, morbidity, mortality, negative affect, stressors

Introduction

Human happiness, as assessed by self-reported life satisfaction, optimism, and positive emotion, is linked to how long individuals live: happier people live longer (eg Deiner & Chan 2011). In contrast, self-reported depression is correlated with increased mortality rates, independent of physical health (eg Rovner et al 1991). This phenomenon may be applicable to animals as well. Classic early work by von Holst (1972), for example, revealed that subordinate male tree shrews (Tupaia belangeri) had higher mortality rates after being repeatedly physically subjugated by a dominant male. More recently, in zoo orangutans (Pongo abelii and P. pygmaeus), individuals that were subjectively judged to be happier were shown to subsequently live longer than those who were deemed less happy (Weiss et al 2011), while in pet dogs (Canis lupus familiaris), those with a fear of strangers lived significantly shorter lives than bolder/more confident conspecifics (Dreschel 2010). These studies suggest that negative affect is correlated with higher mortality and reduced longevity in both humans and animals. Granted, the use of mortality rates to indicate poor health and thus poor welfare in a population is not new: collecting data on on-farm mortality rates is a standard part of Welfare Quality® procedures (eg Chauvin et al 2011). However, in these instances, negative affective states (or poor welfare states) are assumed to be correlates of mortality rate, by being induced by the causes of the elevated mortality (eg high rates of disease, or poor nutrition). This review will explore an alternative link between mortality and negative affect: that negative affective states actually play a causal role in increasing mortality rates. One possible mechanism is that lasting negative affective states cause persistent activation of, or changes in, the body’s stress responses resulting in increased morbidity and mortality (eg Dreschel 2010; Weiss et al 2011). This has been modelled in Figure 1. Some animal researchers have therefore begun using mortality rates to assess the affective impact of potentially stressful habitats or situations that animals experienced while they were alive (eg Clubb et al 2008, 2009; Mason & Veasey 2010). First, we give some definitions. The affective state of an animal or person refers to their experienced feelings, moods or emotions (eg Russell 2003). These can be divided into...