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Editorial

Taking into account animal and human personalities: relevance for health and disease

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Clinical psychologists and psychiatrists have always wondered why some individuals are resilient, whereas others are more susceptible to a given disease, and why some individuals cope better than others with disease progression. This issue dates as long as in the time of the Greek theory of health and individual differences based on the four humors: choleric (excitable), sanguine (lively), phlegmatic (quiet), and melancholic (inhibited). Personality characteristics in humans have a significant heritable component and a proximate basis in genetic polymorphisms and associated neurobiological determinants; they are presumably correlated predictors of important life outcomes such as physical and mental health as well as social and reproductive functioning [1]. For example, the role of personality in cardiovascular diseases came to prominence about 50 years ago with the concept of type A behaviour (a mix of hostility, impatience, competitiveness and dominance), found to be a robust predictor of coronary heart disease [2]. Important research effort is also dedicated to the characterization and early detection of inhibited and uninhibited personality profiles in children to search for predictors and predispositions of anxiety and personality disorders [3, 4]. Individual and population differences have received renewed interest in the Unites States, reflected in the National Institutes of Health promotion of research on "Health Disparities" among social and ethnic groups.

In animal studies individual differences in behaviour and physiology have been considered as annoying noise or random variation in the biomedical tradition, especially in the past. Pavlov, with his seminal studies on dogs, developed the first systematic typology of personality in a non-human species [5], bearing strong similarity to the ancient Greek theory. In 1981 Peter Slater, behavioural biologist at the University of St. Andrews (UK) and a pioneer in the study of birdsong individuality and development, provocatively alerted the scientific community that "the average animal emerging after a statistical treatment may possess a set of features that are not possessed by any single individual in the group" [6]. In 2003 Cavigelli and McClintock with a remarkable longitudinal study [7] showed that neophobic rats had a shorter lifespan than neophilic rats, which were previously individually selected by behavioural screening of responses to novelty. Such differences were accompanied by a differential adrenocortical reactivity: neophobic rats showed consistently higher corticosterone levels upon stressful challenges than neophilic rats.

Animal models are widely used for investigating physiological mechanisms of many diseases and for testing treatments. However, individual differences are often overlooked with the attempt to reduce such variation with all sorts of experimental standardizations, often unsuccessfully [8]. Inter- and intra-individual variation of both genetic and non-genetic origin is an important source of information that animals provide, because it reflects a similar variation in humans and it is what we actually observe in the real world. Reducing such variation as much as possible, a dogma in animal experimentation in order to obtain significant results with few animals could lead to a reduction of the general validity of the experimental results, since it may produce strong selection biases, as underlined by Jaap M. Koolhaas of the University of Groningen (NL) [9].

*The possibility that "character", "temperament" or "personality" of a given individual plays a major role in susceptibility and coping with disease is receiving increased attention in animal research, e.g. in the predisposition to cancer [10, 11]. There is now compelling evidence for the existence of personalities (named by different avenues of literature coping strategies, behavioural syndromes, styles or profiles) in a number of animal species, including those used as models for studying human ageing, stress-related pathologies and disease processes [12, 13]. In animal research, the concept of personality refers to the existence of behavioural and physiological clusters of traits that characterize individuals of the same species, independent of age and sex, when they are consistent over time, though there is some discussion and refinement on operational definitions [14, 15]. Animal personalities may develop early in life (*e.g.*, human infants and juvenile birds, [3, 16], possess an epigenetically regulated basis, have neuroendocrine correlates, may affect cognitive performance and are comparable to human personality traits [9, 17]. The study of animal personality is one of the fastest growing areas of research in behavioural biology and comparative psychology. This has resulted in symposia, talks and special sessions regularly featured in animal behaviour conferences, as well in the publication of many theoretical and empirical articles and special issues entirely dedicated to this topic.*

The study of animal personalities seems therefore important for several reasons: (i) it is conducted with an interdisciplinary approach that integrates proximate mechanisms with ontogenetic, functional, and phylogenetic analyses giving emphasis to the whole organism; (ii) it has important implications for evolutionary theory because different but correlated behavioural patterns do not evolve in isolation, but as a "package" and this can generate tradeoffs and canalizing effects, which in turn set boundaries to unlimited plasticity; (iii) personality has to be taken into account in both field and laboratory animal studies, since different personality types may react differently to similar environments or different experimental treatments (personality traits as reaction norms); (iv) individuals may show differential vulnerability and resilience to stress and artificial housing conditions, with important implications for animal welfare; (v) a better understanding of the mechanisms underlying animal personalities and of the evolutionary causes and consequences of personalities may be translated to humans while providing a better understanding of the nature and evolution of human personalities. For instance, studies in birds have shown not only that individual differences in behaviour are heritable, but also that they are systematically related to fitness, with different optima occurring under different environmental conditions [18]. For humans, such evidence is necessarily more indirect for methodological reasons and because of the profound differences between the contemporary environment and the environmental niches in which we presumably evolved [1, 19].

Research on animal personalities poses theoretical and empirical challenges. Theoretically, it requires disentangling the evolutionary mechanisms that may account for the origin and maintenance of clusters of interrelated phenotypic traits. Empirically, this research requires descriptive longitudinal studies, including studies of relationships between different behavioural patterns, and their consistency across situations; studies on genetic and physiological mechanisms underlying the clustering of behavioural traits, such as pleiotropy, gene linkage, or common neuroendocrine substrates; ontogenetic studies on plasticity and environmental malleability; field studies on survival and reproduction to understand how different personality profiles are maintained and under what circumstances they can be selected for to form.

Personality studies will increasingly affect applied biomedicine and translational approaches. A truly comparative trend exploiting appropriate and sound infra-human models will be highly beneficial: particularly, for both nosographic revisions and to correct pathological or risky lifestyles by checking personality-tailored preventive strategies.

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