

Animal Personality¹⁾

Samuel D. GOSLING and Zezelia OLSON

Department of Psychology, University of Texas, Austin

Animal studies have been appealing to many areas of psychology because, in comparison with human studies, they afford greater experimental control, more options for measuring physiological and genetic parameters, greater opportunities for naturalistic observation, and an accelerated life course. Thus, it makes sense that interest in and research on animal personality has flourished in recent years. Reviews of the literature show that: (a) personality exists and can be measured in animals; (b) studies of animal personality fall into three broad domains (animal-model research, behavioral ecology, and practical applications); (c) personality can be identified in a broad array of species; and (d) some traits show more cross-species generality than others. Conceptual and empirical analyses show that personality can be assessed in animals using rating and behavior-coding methods; comparisons of the two methods suggest that ratings are generally superior to behavior codings. Animal personality research is well placed to shed light on the genetic, biological, and environmental bases of personality and to illuminate research on personality development, personality perception, and the links between personality and health.

Key words: animal, personality, temperament, behavioral syndromes

In the early 1990s, I (SDG) enrolled in graduate school to study personality at the University of California, Berkeley. At the time, studying personality automatically meant studying *human* personality. The first-year graduate seminar addressed the most basic issues in the field. When it came to tackling the question, “what is personality?” I turned to my undergraduate training in philosophy, trying to un-

pack the meaning of “personality” by *reductio ad absurdum*, pushing the concept to a point where it no longer made sense. What could be learned about personality by considering cases, like non-human animals, where personality clearly didn’t exist? But the more deeply I examined the question the harder it became to find reasons to suggest animals did not have personality. In fact, when I searched the literature I began to find isolated studies—most notably Joan Stevenson-Hinde’s seminal work on rhesus monkeys (e.g., Stevenson-Hinde, Stillwell-Barnes, & Zunz, 1980; Stevenson-Hinde & Zunz, 1978)—that suggested the very opposite conclusion: Animals did seem to have personality. This experience prompted me to undertake several systematic reviews of the literature on animal person-

1) 2007年9月21日、パーソナリティ心理学会国際交流委員会の主催により、Samuel D. Gosling氏の講習会『人や動物のパーソナリティを測定する方法 (Measuring Personality in Humans and Other Animals)』が開催された。本論文は、その講習会で扱った内容に基づくレビュー論文として、国際交流委員会よりGosling氏に執筆を依頼したものである。(記：国際交流委員会委員長 小塩真司)

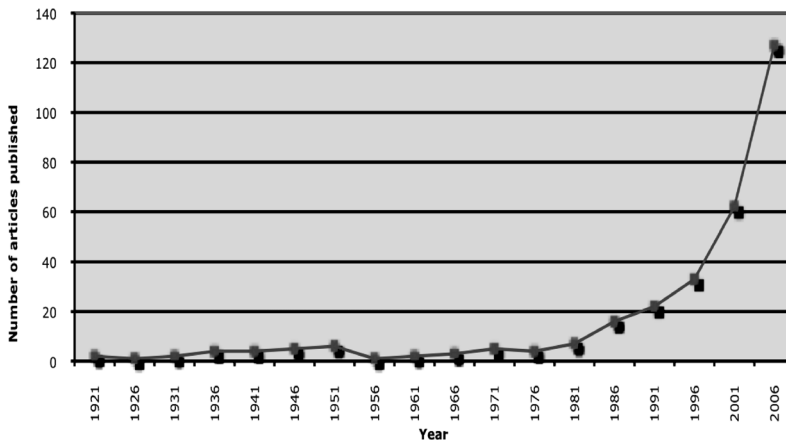


Figure 1 Animal Personality Keywords

ality (Gosling, 2001; Gosling & John, 1999; Gosling & Vazire, 2002), which culminated in outlining a research program for animal personality research. The outline consisted of three phases:

- Phase 1: Review, summarize, and evaluate previous research.
- Phase 2: Address measurement issues and develop assessment methods.
- Phase 3: Use animal models to address basic and applied issues in personality research and elsewhere.

In this article, we summarize the state of research on animal personality, organizing the research in terms of these three phases.

Phase 1: Literature Reviews

The purpose of the first phase of the research program was to establish the conceptual and empirical foundations of comparative personality research. To do this, I reviewed and summarized the literature pertaining to personality in nonhuman animals. The reviews revealed that a wide range of studies had been performed but they were scattered across a disparate array of disciplines, including psychology, veterinary medicine, primatology,

and agricultural science.

To examine the historical trends in publications on animal personality we conducted a PsychINFO search for the period 1907 and 2007. We searched for articles in which animals were listed as the population and used the keywords “personality,” “temperament,” and “behavioral syndromes.” The data, which are plotted in Figure 1, show that up until the 1990s, scarcely any research was published on animal personality. After that, publications began to appear, with a particularly dramatic rise during the last decade. In fact, the last five years (2002–2007) saw more than double the number of articles published in the previous five years (1997–2001), and the number of articles appearing in the last decade substantially exceeds the number of articles published over the previous century (118).

What has been learned from this burgeoning research? Reviews of the literature (Gosling, 2001, 2008; Gosling & Harley, in press; Gosling & John, 1999; Gosling & Vazire, 2002; Jones & Gosling, 2005, in press; Mehta & Gosling, 2006, in press; Weinstein, Capitanio, & Gosling, in press) have revealed several key findings, which are summarized below.

Personality Exists and Can Be Measured in Animals

Researchers in this field have long faced doubts about the very existence of personality in animals. The concerns range from philosophical arguments regarding the uniqueness of humans to methodological concerns about the perils of anthropomorphism. Therefore, much of our early work focused on evaluating the viability of the personality concept in non-human individuals. Gosling, Lilienfeld, and Marino (2003b; see also Gosling & Vazire, 2002) evaluated the evidence pertaining to the existence of personality in animals. Explicitly drawing on the lessons learned from the debates concerning the existence of personality in humans (Kenrick & Funder, 1988), Gosling et al., (2003b) considered three major criteria that must be met to establish the existence of personality traits in animals: (1) assessments by independent observers must agree with one another; (2) these assessments must predict behaviors and real-world outcomes; and (3) observer ratings must be shown to reflect genuine attributes of the individuals rated, not merely the observers' implicit theories about how personality traits covary. On all three criteria, animal-personality research met the standards expected of human-personality research. Moreover, numerous studies have demonstrated temporal stability in personality traits (e.g., Capitanio, 1999; Stevenson-Hinde et al., 1980; Uher, Asendorpf, & Call, 2008). Together the research provides strong evidence that personality does exist in animals.

To test the idea that personality characterizations of animals may just reflect anthropomorphic projections, Kwan, Gosling, and John (2008) distinguished two potential forms of anthropomorphism: "Egocentric anthropomorphism," which refers to an individual projecting his her or her own self views

onto an animal, and "Homocentric anthropomorphism," which refers to individuals projecting their views of humans in general onto animals. Kwan et al. used a round-robin design in which multiple humans interacted with and rated multiple dogs and then analyzed the ratings using Kenny's (1994) Social Relations Model. Kwan et al. found relatively little evidence for anthropomorphic projections onto the dogs, suggesting that anthropomorphism may pose less of a threat to studies of complex psychological characteristics in animals than human-to-human projection poses to studies of humans.

Animal Personality Research Falls into Three Broad Domains

Weinstein et al. (in press) showed that studies of animal personality fall into three broad domains.

Animal model research. Nonhuman animals have long been used to model a wide range of psychological processes in humans. Recently, researchers have recognized that animal studies can also be used to learn about human personality processes (Malloy, Barcelos, Arruda, DeRosa, & Fonseca, 2005). Animal studies offer four major advantages over human research. First, animal studies allow greater experimental control and enable more extensive experimental manipulations than is ethically possible in studies of humans. Second, such studies afford greater opportunities to measure physiological parameters and obtain detailed quantitative and molecular genetic information that make transgenic, knock-out, and cloning studies possible (Gosling & Mollaghan, 2006). Third, animal studies afford greater opportunities for naturalistic observation because animals can be observed for greater periods of time, in more detail, and in more contexts. Fourth, the shorter lifespan of many non-human animals make it possible to conduct longitudinal studies that yield important insights in

a timely manner and at a fraction of the cost of equally comprehensive human studies. As a result of these advantages animal studies are increasingly being used to understand personality phenomena that would be difficult or impossible to address using human studies alone.

Behavioral ecology. Studies of personality are proving to be increasingly useful to researchers interested in animal behavior. Information on consistent individual differences provides a new angle on understanding the different strategies that an animal uses to accomplish day-to-day tasks in order to survive and reproduce, such as obtaining food, protecting oneself from predators, and securing a mate. In this field, the term “behavioral syndromes” is often used in lieu of personality (Sih, Bell, Johnson, & Ziemba, 2004).

Practical applications. There are numerous opportunities for the practical application of animal personality research, including improving animal welfare and improving the effectiveness of working animals such as seeing-eye dogs and drug detection dogs (e.g., Maejima et al., 2007; Svartberg, 2005).

Personality Traits Have Been Identified across a Wide Range of Taxa

In the most comprehensive review to date, Gosling (2001) identified 187 personality studies of one kind or another in 64 different species. The species studied were far from representative of the species in existence—84 percent of the studies in the review focused on mammals (29% primates, 55% non-primates), 8% focused on fish, 4% focused on birds, and the remaining 4% were divided among reptiles, amphibians, arthropods, and mollusks. Since then however, many more species have been studied including Orangutans (Weiss, King, & Perkins, 2006), greylag geese (Kralj-Fiser, Scheiber, Blejec, Moestl, & Kotrschal, 2007), perch (Magn-

hagen, 2007), lizards (Cote & Clobert, 2007), squid (Sinn, Gosling, & Moltschaniwskyj, 2008), and field crickets (Kortet & Hendrick, 2007). It should be noted that researchers in other fields often do not explicitly conceptualize the consistent individual differences in behavior in terms of personality so it is easy to miss relevant studies done outside the field of psychology.

Some Traits Show More Cross-Species Generality Than Others

A large number of personality traits have been identified in animals, but are there any that show particularly strong cross-species generality? It can be argued that the most basic personality traits will appear across multiple species. Most empirical studies of animal personality focus on just a single species so cross-species commonalities must be identified by combining studies. One review summarized the evidence for cross-species commonalities in personality in 19 factor-analytic studies, representing 12 different species (Gosling & John, 1999). The review included studies using both personality ratings and behavioral codings and the findings were organized in terms of the human Five Factor Model plus dominance and activity.

The dimensions of Extraversion, Neuroticism, and Agreeableness showed considerable generality across the 12 species included in the review. Factors related to Openness (usually curiosity or playfulness), were identified in all but four of the 12 species. Other factors showed less cross-species generality. For example, dominance emerged as a clear separate factor in seven of the 19 studies and a separate Activity dimension was identified in two of the studies. Chimpanzees were the only non-human species with a separate Conscientiousness factor, which included the lack of attention and goal-directedness and erratic, unpredictable, and

disorganized behavior typical of the low pole in humans; this finding is consistent with the fact that both humans and chimpanzees have relatively developed frontal cortices, the area of the brain responsible for higher executive function like making plans and controlling impulses (Beer, Shimamura, & Knight, 2004).

In making cross-species comparisons, questions inevitably arise about the equivalence of traits in different species. How can it be determined that what appears to be boldness in squid or trout or chimpanzees is in any way similar to boldness in humans? To solve this challenge, cross-species researchers can draw from the lessons learned by cross-cultural researchers (Gosling & Harley, *in press*). A comparative researcher asking whether the apparently sociable behavior of a rhesus monkey reflects the sociability that we know in humans is analogous to the cross-cultural emotions researcher asking whether the apparently angry expression of a hitherto isolated group of humans reflects the anger that we know in our own culture. The solution to determining cross-cultural equivalence of anger expressions is examining what comes before and after the expressions, and where possible, looking for commonalities in underlying physiology. Likewise, an animal researcher can examine the apparently sociable behavior in the context of what comes before and after the behavior and, where possible, if it shares physiological, biological, and genetic commonalities with human sociability. Researchers can use this procedure when they encounter unfamiliar species or when they want to establish cross-species equivalences empirically.

Phase 2: Establish the Measurement Foundations and Develop Methods

Having shown it is meaningful to refer to personality in animals, the next step was to determine whether it could be measured with adequate levels of reliability and validity (Gosling, 2001; Uher, *in press*). Although personality traits had been assessed in a variety of species, such as rhesus monkeys (Stevenson-Hinde & Zunz, 1978), hyenas (Gosling, 1998), and octopuses (Mather & Anderson, 1993), no research had explicitly compared assessments of humans and animals in a single design. Therefore, Gosling, Kwan, and John (2003a) examined side-by-side the accuracy of personality ratings of 78 dogs and their owners. Gosling et al. used parallel procedures and instruments to compare the ratings in terms of three accuracy criteria: internal consistency, consensus, and correspondence. On all three criteria, judgments of dogs were as accurate as judgments of humans, again suggesting that personality differences do exist and demonstrating that personality traits can be measured in animals. These findings are consistent with the growing body of research measuring personality in individual species, further supporting the viability of assessing personality in animals.

One ongoing debate has concerned whether personality is best measured by coding of an animal's overt behaviors, or by obtaining subjective ratings of broad traits by knowledgeable observers (e.g., human caretakers). The two methods reflect different resolutions to the supposed trade-off between quantifying personality in terms of objective behaviors and using humans to record and collate information more subjectively. Behavior codings, which are the preferred method for biological researchers, have been used more often than ratings; in one re-

view, 74% of animal-personality studies had used behavior codings to assess personality, and only 34% had used trait ratings (Gosling, 2001). Although both methods have been used for assessing personality, many animal behavior researchers regard behavior codings as intrinsically superior to global personality ratings. In contrast, many human researchers argue that behavior codings actually deserve the closest scrutiny.

Vazire, Gosling, Dickey, and Schapiro (2007) argued that there are three reasons to predict that trait ratings will generally be more reliable than behavioral codings. First, ratings aggregate across time and contexts. The variance in behaviors across situations and time can sometimes be extreme, especially for behaviors that occur only in rare circumstances. Trait ratings are better than behavior codings because they are able to detect low base-rate behaviors because of their greater aggregation across time. For example, a dog owner can accurately report whether or not her dog tends to bite humans, whereas even months of detailed observations may not be enough to detect such behavior if it is infrequent. Second, ratings often aggregate across observers. Both coding and rating methods could benefit from this tactic, but as they are currently practiced, only trait rating methods do so. Aggregating ratings across multiple observers enhances reliability by reducing measurement error due to the systematic idiosyncracies of an observer (Block, 1961). For example, one observer may consistently interpret submissive behavior as playful, but this source of error will be minimized when ratings are aggregated across multiple observers. Finally, raters can take context into account. Some variability in behavior is due to changes in the animal's situations or environment. For example, an individual may be active at one moment but inactive

at another, but the variability in activity level may be due to situational factors, such as feeding time. One way to reduce the effects of this kind of variability is to take the situation into account when assessing personality. Observers making trait ratings can discount situational influences on behavior when making their ratings. In contrast, an observer making their behavior codings would treat all instances of a behavior the same way, regardless of the situation.

Recent direct comparisons of the two methods suggest that ratings are indeed superior to behavior codings for capturing personality traits because rating methods are more reliable, are not as subjective as is widely assumed, and are generally much more practical (Vazire et al., 2007). Thus, trait ratings are well-suited for detecting consistencies in animals' behaviors, the very foundation of personality. Of course, where time and resources permit, both methods should be used.

Phase 3: Address Substantive Questions

Phase 3 is where the comparative approach begins to payoff. Gosling (2001) proposed six domains as particularly likely to benefit from comparative research: understanding the (1) genetic, (2) biological, and (3) environmental bases of personality and illuminating research on (4) personality development, (5) personality perception, and (6) the links between personality and health. With the theoretical and measurement foundations now complete, researchers are beginning to reap the benefits of animal research.

To illustrate the substantive contributions that animal personality research can make, consider John Capitanio's research program, which for over a decade has been accruing personality data on over 175 rhesus monkeys (see Weinstein et al., in press,

for description of this research program). He assessed their personalities at 5–10 years of age, identifying a four-factor structure, which was later confirmed with confirmatory factor analysis in a separate subsample. Animals were tested in a variety of social and nonsocial situations and behavioral and physiological measures were obtained in these situations for up to several years following the initial personality assessments; personality was found to predict various measures of social behavior and emotionality, plasma cortisol concentrations, tetanus- and herpesvirus-specific antibody responses, heart rate, and central nervous system functioning. For example, Sociability scores predicted patterns of neural innervation of lymph nodes, moderated the response to a social stressor, and influenced expression of genes associated with innate immune responses.

Current Standing of Research in Animal Personality

As shown in Figure 1, research on animal personality has experienced explosive growth over the past decade. This surge of research attention has been accompanied by increased acceptance of the topic in scientific circles. Indeed, whereas earlier papers sometimes used terms like “temperament” to avoid the anthropomorphic associations of “personality,” several recent articles using “personality” have appeared in the most prestigious scientific journals such as *Nature* (e.g. Wolf, van Doorn, Leimar, & Weissing, 2007) and *Proceedings of the Royal Society* (e.g. Fidler et al., 2007). Moreover, there now appears to be widespread acceptance of animal studies in establishment outlets; for example, chapters on animal personality appear in the most recent Handbooks of Personality (Gosling & Harley, in press; Weinstein et al., in press) and the latest Handbook of Personality Research Methods

(Vazire et al., 2007).

In ten years the field has come a long way. It appears that animal research is poised to make substantial theoretical and applied contributions to personality and is at last becoming a mainstream area of the field. In fact, many graduate students now entering Ph.D. programs find the topic on the syllabi of their first-year personality seminars.

References

- Beer, J. S., Shimamura, A. P., & Knight, R. T. (2004). Frontal lobe contributions to executive control of cognitive and social behavior. In M. S. Gazzaniga (Ed.) *The cognitive neurosciences III* (pp. 1091–1104). Cambridge, MA: MIT Press.
- Block, J. (1961). *The Q-sort method in personality assessment and psychiatric research*. Springfield, IL: Charles C. Thomas.
- Capitano, J. P. (1999). Personality dimensions in adult male rhesus macaques: Prediction of behaviors across time and situation. *American Journal of Primatology*, **47**, 299–320.
- Cote, J., & Clobert, J. (2007). Social personalities influence natal dispersal in a lizard. *Proceedings of the Royal Society B*, **274**, 383–390.
- Fidler, A. E., van Oers, K., Drent, P. J., Kuhn, S., Mueller, J. C., & Kempenaers, B. (2007) Drd4 gene polymorphisms are associated with personality variation in a passerine bird. *Proceedings of the Royal Society B*, **274**, 1685–1691.
- Gosling, S. D. (1998). Personality dimensions in spotted hyenas (*Crocuta crocuta*). *Journal of Comparative Psychology*, **112**, 107–118.
- Gosling, S. D. (2001). From mice to men: What can we learn about personality from animal research? *Psychological Bulletin*, **127**, 45–86.
- Gosling, S. D. (2008). Personality in non-human animals. *Social and Personality Psychology Compass*, **2**, 985–1001.
- Gosling, S. D., & Harley, B. A. (in press). Animal Models of Personality and Cross-Species Comparisons. In P. Corr, & G. Matthews (Eds.), *Cambridge handbook of personality psychology*. Cambridge, UK: Cambridge University Press.
- Gosling, S. D., & John, O. P. (1999). Personality dimensions

- in non-human animals: A cross-species review. *Current Directions in Psychological Science*, **8**, 69–75.
- Gosling, S. D., Kwan, V. S. Y., & John, O. P. (2003a). A dog's got personality: A cross-species comparative approach to evaluating personality judgments. *Journal of Personality and Social Psychology*, **85**, 1161–1169.
- Gosling, S. D., Lilienfeld, S. O., & Marino, L. (2003b) Personality. In D. Maestriperieri (Ed.), *Primate psychology: The mind and behavior of human and nonhuman primates* (pp. 254–288). Cambridge: Harvard University Press.
- Gosling, S. D., & Mollaghan, D. M. (2006). Animal research in social psychology: A bridge to functional genomics and other unique research opportunities. In P. A. M. van Lange (Ed.), *Bridging social psychology: Benefits of transdisciplinary approaches* (pp. 123–128). Mahwah NJ: Erlbaum.
- Gosling, S. D., & Vazire, S. (2002). Are we barking up the right tree? Evaluating a comparative approach to personality. *Journal of Research in Personality*, **36**, 607–614.
- Jones, A. C., & Gosling, S. D. (2005). Temperament and personality in dogs (*Canis familiaris*): A review and evaluation of past research. *Applied Animal Behaviour Science*, **95**, 1–53.
- Jones, A. C., & Gosling, S. D. (in press). Individual differences in approach and avoidance motivation in animals. In A. J. Elliot (Ed.), *Handbook of approach and avoidance motivation*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Kenny, D. A. (1994). *Interpersonal perceptions: A social relations analysis*. New York: Guilford Press.
- Kenrick, D. T., & Funder, D. C. (1988). Profiting from controversy: Lessons from the person-situation debate. *American Psychologist*, **43**, 23–34.
- Kralj-Fiser, S., Scheiber, I. B. R., Blejec, A., Moestl, E., & Kotschal, K. (2007). Individualities in a flock of free-roaming greylag geese: Behavioral and physiological consistency over time and across situations. *Hormones and Behavior*, **51**, 239–248.
- Kortet, R., & Hedrick, A. (2007). A behavioural syndrome in the field cricket *Gryllus integer*: Intrasexual aggression is correlated with activity in a novel environment. *Biological Journal of the Linnean Society*, **91**, 475–482.
- Kwan, V. S. Y., Gosling, S. D., & John, O. P. (2008). Anthropomorphism as a special case of social perception: A cross-species social relations model analysis of humans and dogs. *Social Cognition*, **26**, 129–142.
- Maejima, M., Inoue-Murayama, M., Tonosaki, K., Matsuura, N., Kato, S., Saito, Y., Weiss, A., Murayama, Y., & Ito, S. (2007). Traits and genotypes may predict the successful training of drug detection dogs. *Applied Animal Behaviour Science*, **107**, 287–298.
- Magnhagen, C. (2007). Social influence on the correlation between behaviours in young-of-the-year perch. *Behavioral Ecology and Sociobiology*, **61**, 525–531.
- Malloy, T., Barcelos, S., Arruda, E., DeRosa, M., & Fonseca, C. (2005). Individual differences and cross-situational consistency of dyadic social behavior. *Journal of Personality and Social Psychology*, **89**, 643–654.
- Mather, J. A., & Anderson, R. C. (1993). Personalities of Octopuses (*Octopus rubescens*). *Journal of Comparative Psychology*, **107**, 336–340.
- Mehta, P. H., & Gosling, S. D. (in press). Bridging Human and Animal Research: A Comparative Approach to Studies of Personality and Health. *Brain, Behavior, and Immunity*.
- Mehta, P. H., & Gosling, S. D. (2006). How can animal studies contribute to research on the biological bases of personality? In T. Canli (Ed.), *Biology of personality and individual differences* (pp. 427–448). New York: Guilford.
- Sih, A., Bell, A. M., Johnson, J. C., & Ziemba, R. E. (2004). Behavioral syndromes: An integrative overview. *Quarterly Review of Biology*, **79**(3), 241–277.
- Sinn, D. L., Gosling, S. D., & Moltschanivskyj, N. A. (2008). Development of shy/bold behaviour in squid: Context-specific phenotypes associated with developmental plasticity. *Animal Behaviour*, **75**, 433–442.
- Stevenson-Hinde, J., Stillwell-Barnes, R., & Zunz, M. (1980). Individual differences in young rhesus monkeys: Consistency and change. *Primates*, **21**, 498–509.
- Stevenson-Hinde, J., & Zunz, M. (1978). Subjective assessment of individual rhesus monkeys. *Primates*, **19**, 473–482.
- Svartberg, K. (2005). A comparison of behaviour in test and in everyday life: Evidence of three consistent boldness-related personality traits in dogs. *Applied Animal Behaviour Science*, **91**, 103–128.
- Uher, J. (2008). Comparative personality research: Methodological approaches. *European Journal of Personality*, **22**, 427–455.
- Uher, J., Asendorpf, J. B., & Call, J. (2008). Personality in the behaviour of great apes: Temporal stability, cross-sit-

- uational consistency and coherence in response. *Animal Behaviour*, **75**, 99–112.
- Vazire, S., Gosling, S. D., Dickey, A. S., & Schaprio, S. J. (2007). Measuring personality in nonhuman animals. In R. W. Robins, R. C. Fraley, & R. Krueger (Eds.), *Handbook of research methods in personality psychology* (pp. 190–206). New York, NY: Guilford.
- Weinstein, T. A. R., Capitano, J. P., & Gosling, S. D. (2008). Personality in animals. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality theory and research* (pp. 328–348) New York: Guilford.
- Weiss, A., King, J. E., & Perkins, L. (2006). Personality and subjective well-being in orangutans (*Pongo pygmaeus* and *Pongo abelii*). *Journal of Personality and Social Psychology*, **90**, 501–511.
- Wolf, M., van Doorn, G. S., Leimer, O., & Weissing, F. J. (2007, May 31). Life-history trade-offs favour the evolution of animal personalities. *Nature*, **447**, 581–584.