Similarities in Differences

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Individual differences among humans are a well-known and well-studied phenomenon. Do they also occur in animals?

Individual differences among people manifest themselves to us every day. The people we meet differ in the physical sense, being of differing height and having different eye and hair color, but they are also gifted with various abilities, distinctive personality traits, and different attitudes towards the world. The field of psychology that deals with individual differences covers all these aspects, studying the occurrence of differences in every type of psychical and mental trait.

Variation in humans

The occurrence of individual differences is explained in terms of two main factors: genetic differences and environmental variation. The importance of the genetic basis becomes clear when we look at studies of twins, which make it possible to calculate the inheritance ratio. This parameter specifies quantitatively to what extent a given behavior can be explained in terms of the influence of genetic factors, although it does not identify which particular genes are responsible. To do the latter, we need to employ the techniques of molecular genetics.

Depending on the personality trait studied, the inheritance indicator may take on different values. Research our team has done in collaboration with our German colleagues has shown that, in both countries, the genetic basis accounts for 30-40% of variation in traits of temperament. In the case of intelligence, the genetic influence explains 50% of the observed variability, with the remainder being shaped by environmental factors.

The inheritance ratio differs somewhat for each trait considered. While in the case of personality or intelligence, variation can be explained in terms of the direct influence of genetic or environmental factors, it is significantly more difficult to explain individual differences in terms of attitudes that appear or are shaped at a later stage in life. A good example of this can be found in one's attitude on the issue of capital punishment. Inheritance explains 60% of the observed variation in opinions among people, but studies recently carried out have shown that support for the death penalty is linked to the male gender and to personality traits like strong extraversion, greater emotional instability, and less openness to experience.

Estimating the degree of inheritance is significantly easier than the task of pinpointing differences in specific genes that actually explain the differences in behavior, known as polymorphisms. That is because there are thousands of markers responsible for a complex characteristic, with the influence of an individual marker frequently being too subtle to detect. Sometimes, however, researchers manage to do so. It has been shown, for instance, that a liberal political stance is related to polymorphism in the dopamine receptor gene DRD4 in individuals who had a numerous circle of friends and acquaintances in adolescence. If similar results were to be reached in other studies, that would enable us to conclude that there is a significant degree of interaction between genetic and environmental factors in shaping attitudes.

A common genetic basis is shared by such traits as openness, conciliatoriness, conscientiousness, and individual religiousness. Similar genetic and environmental factors also explain the links between ideology, conservatism, egalitarianism, societal orientation, and rightwing authoritarianism. Strong genetic correlations have been obtained for measures of intelligence performed between the ages of 5 to 18 years. Even the ratio between a person's intelligence and their body height is inherited, being 71% at-

tributable to genetic factors. The occurrence of a common genetic basis for different psychological characteristics suggests that they are underpinned by a common biological mechanism, and that individual differences between people can therefore be ascribed to a greater degree to differing influence of environmental factors.

Humans also show differentiation in gender-related personality traits. In women, the genetic influence is stronger than in men in terms of physical activity, the sense of happiness, addiction to cannabinoids, and deciding to have and raise children. In men, in turn, genetic factors more strongly determine length of sleep, Internet addiction, the age of initiation to smoking tobacco, and the combination of alcoholism and pathological gambling. Genes are also linked to symptoms of anxiety and depression, Body Mass Index (BMI) and other indicators of obesity, and also motivation to seek a partner outside one's existing relationship and a positive attitude towards one's parents.

Animal personality

Individual differences also occur in the animal world, and they are described using the concept of "personality" borrowed from human psychology. In animals, "personality" usually refers to differences in individual reactions or complex behaviors which are stable over time. It is assumed that individual differences in animal behavior are the result of differences in how they react to information about the environment, not to variation in the environment itself. Genetically conditioned differences have been identified in the behavior of rats, for instance in terms of motor or exploratory activity, and also mice (e.g. susceptibility to alcohol), dogs, cats, and horses. New data has been appearing in recent years, pointing to the presence of such differences also in birds, fish, and corals.

The birds known as great tits (*Parus major*), for instance, differ in terms of their immunological reaction to social stress. When birds that had been raised individually and which showed differing speeds of exploratory behavior were relocated into a common aviary, a stressful situation for them, the level of stress was found to be greater in individuals who had explored their environment more slowly, and therefore differed from the others in terms of temperament. Moreover, greater stress was observed in females.

Another study, using starlings, aimed to test whether anxiety of humans would manifest differently in birds raised in captivity than those captured from free-living conditions. When placed in a small cage, wild birds tried to free themselves more quickly, which could either indicate a higher level of fear or their employment of a stress-coping method familiar to them. The two groups did not differ, on the other hand, in terms of their reactions to new stimuli or exploratory behavior.

A study of rainbow trout (*Oncorhynchus mykiss*) larvae showed that those with greater stores of energy derived from the egg yolk were more aggressive compared to those with smaller resources of food at their disposal. They also showed lesser serotoninergic activity, involving the so-called "happiness hormone." Greater serotonin activity was shown by larvae with lesser resources, which also exhibited lesser aggression. These results point to a link between available energy and aggressive behaviors.

The genetic underpinnings of behavior can be observed not only in vertebrates. For instance, beadlet anemones (*Actinia equina*) have shown highly repetitive reactions – closing

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their tentacles, as is usually provoked by a fish swimming nearby (in other words by potential food), in reaction to a stimulus involving the sudden injection of water containing small marine organisms in the vicinity of their mouth.

In this context, the results of a study on the common chimpanzee should come as no surprise. Personality traits were diagnosed in these animals using the same Big Five model used in studying human personality, which measures the factors of neuroticism, extraversion, openness, agreeableness, and conscientiousness. Variability in these traits was analyzed in the context of polymorphisms in the gene coding for the vasopressin receptor (AVPR1A). Polymorphisms in this gene were found to show gender-specific correlations with personality traits in the animals: males with the allele DupB+ had a higher level of alpha-stability factor and a lower level of disinhibition compared to females, whereas individuals with two different alleles of the gene (DupB -/+) exhibited a lower level of dominance in the case of males, yet a higher level in the case of females. Research performed on humans in Poland has shown that the occurrence of a shorter version of the dopamine receptor coding gene (DRD4) was linked to a higher level of sensory sensitivity, whereas individuals with the longer version showed a lower level of the same trait. In women, a converse correlation was found. And so in both humans and chimpanzees, the presence of the same allele may affect personality traits differently depending on gender.

In summary, individual differences and gender-related differences are present in both humans and animals, with both genetic and environmental factors contributing. As a result, variation among individuals has become a phenomenon that makes both the human and animal world significantly more interesting. ■

Further reading:

Oniszczenko W., Dragan W.Ł. (2008). *Genetyka zachowania w psychologii i psychiatrii* [Genetics of Behavior in Psychology and Psychiatry]. Warsaw: Scholar.

Fratkin J.L., Sinn D.L., Patall E.A., Gosling S.D. (2013). Personality consistency in dogs: A meta-analysis. *PLoS ONE 8(1)*, e54907.

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Genetically conditioned differences have been identified in the behavior of rats, mice, dogs, cats, and horses