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Evolutionary By-product



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Synonyms

Spandrels

Definition

Biological and psychological traits can have an adaptive function (i.e., adaptation) or appear as a (nonadaptive) by-product of another adaptation (i.e., spandrels or by-product).

Evolutionary Psychology

Evolutionary approaches have become very popular in many areas of the behavioral and social sciences. Evolutionary psychology argues that most human behaviors can be explained by internal psychological mechanisms and claims that the reason for these mechanisms to have emerged in our evolutionary past is to provide solutions to the adaptive problems our ancestors have faced. In

other words, many of these psychological mechanisms exist because they provided a solution to problems related to survival and reproduction in the past. The main purpose of evolutionary psychology as a research program is to identify these psychological mechanisms directing behavior that are the product of evolutionary processes. What we mean by a psychological mechanism are mental capacities like the ability to acquire language, the ability to detect cheating, the tendency to make moral judgments, the tendency to learn about the fear of snakes, the ability to recognize relatives, the tendency to find certain characteristics of the opposite sex attractive, and the ability to identify others' cognitive and emotional states.

According to this view, human behavior is not a direct product of natural selection; instead, psychological mechanisms evolve as a result of natural selection (and other evolutionary processes) and behavior emerges as a result of an interaction between these mechanisms and environmental conditions. The brain is a kind of computer that has developed to collect inputs from the environment. Programs in the brain are adaptations. All of these adaptations may not be adaptive at present, but they were adapted to the environmental conditions in which our ancestors lived (Tooby and Cosmides 2005). In this sense, evolutionary psychology differs from cognitive psychology. While both address the importance of internal mechanisms in influencing behavior, evolutionary psychologists also focus on what ultimately explains these behaviors; that is, whether they contributed

to the survival and reproductive success of our ancestors. Cognitive psychologists, on the other hand, are content with providing only proximal explanations of these behaviors.

A second assumption in evolutionary psychology is that the mind is modular. That is, different adaptations have emerged in humans to solve many different adaptive problems they encounter in the environmental conditions they evolved. Therefore, according to this point of view, the mind should consist of many different modular mechanisms for solving specific problems rather than a single mechanism for solving general problems. In other words, just as there are different organs in the body having different functions, the mind may also consist of different adaptations of this kind.

In evolutionary psychology, there are two different levels of explanation. The first is the ultimate explanation that reveals the evolutionary roots of behavior (explains why and how it evolved) and reveals its underlying foundations. For example, the proposal that the reason language evolved is that it promotes interhuman cooperation is a kind of ultimate explanation. The proximate explanation, on the other hand, deals with elucidating the psychological and neurobiological underpinnings of that behavior. For example, the proposal that the reason we help our sibling is our emotional closeness to him/her is a kind of proximate explanation.

Although evolutionary psychology has been subjected to quite a bit of criticism from both philosophers and biologists to date (e.g., Buller 2005; Richardson 2007; for responses, see Hagen 2015; Confer et al. 2010), it has become quite popular in recent years. One of the reasons for its popularity is the theoretical developments in evolutionary biology, especially in the second half of the twentieth century. These developments include William Hamilton's idea of inclusive fitness and kin selection; George Williams's books that led to the drop of the idea of group selection off the map; Robert Trivers's reciprocal altruism, parental investment, and parent-offspring conflict theories; and game theory and the concept of evolutionarily stable strategy that John Maynard-Smith carried from economics to evolutionary

biology. In addition to these advances in biology, evolutionary psychology has also gained tremendous popular support over the past 20 years. In addition to the theoretical developments listed above, Edward Wilson's *Sociobiology* book, which is an excellent synthesis of the evolutionary foundations of social behavior, and Richard Dawkins' book *The Selfish Gene* popularized all these ideas and presented them in a new perspective (Buss 2012).

Adaptation and By-product

According to the adaptive view of the modern evolutionary approach based on Charles Darwin's theory of natural selection, biological features can have an adaptive function (i.e., adaptation) or appear as a by-product of another adaptation (i.e., spandrel or by-product). Although evolutionary by-products do not directly lead to adaptive advantage, they emerge as a derivative of another adaptation that leads to adaptive advantage. To give an example of by-products in this situation, the umbilical cord can be taken as a typical example of adaptation due to its function of allowing nutrient exchange between the placenta and the embryo. As far as we know, the belly button, which does not directly lead to adaptive advantage, is a by-product of another adaptation (i.e., umbilical cord) because everyone who has an umbilical cord has a belly button. This explains why, although not adaptive, by-products persist in the population for generations.

In addition to adaptations and by-products, there are individual differences that occur entirely by chance, as far as we know, which we will define as a random product. In other words, although the belly button appears in all members of the species, the shape of the belly button varies from person to person, and this can be defined as the accidental variation due to the by-product that does not have any adaptive function.

One of the main difficulties in evolutionary approaches is the process of deciding what is an adaptation and what is a by-product. Especially in the field of evolutionary psychology, this ambiguity is more tangible than in evolutionary biology

because one of the preconditions to be able to call something an adaptation is that trait have a genetic basis. However, we have very limited knowledge about the genetic basis of many psychological processes and behaviors, because psychological behaviors are generally not affected by a single gene as they are complex structures, but are formed as a result of the interaction of many genes. This makes it difficult to identify the genetic origins of many psychological processes underlying behavior. Apart from having a genetic basis, adaptations should be seen in all members of the species, except for those specific to gender. The fact that this feature is seen in all members is an important indicator that distinguishes adaptations from other features, as it is a direct reflection of the evolutionary process and gives species-specific functionality. The third criterion is that adaptations arise in the process of development and therefore do not have to be innate. Another important feature of adaptations is that it solves a problem in the past environment effectively and economically (see Schmitt and Pilcher 2004, for an in-depth discussion of the criteria to be used in identifying psychological adaptations).

Adaptation or By-product?

In this final section, we will illustrate the adaptation-by-product debate on the basis of several proposed psychological mechanisms. It has been argued, for example, that religious belief is an adaptation that arises due to its promotion of intragroup cooperation through the fear of supernatural punishment (Johnson 2015). In other words, according to the adaptationist view of religion, religion provides a very effective solution to the problem of free-riding due to its reliance on belief in supernatural agents, which has the capacity to punish every moral transgressor by monitoring every human behavior. According to this view, often referred to as *the supernatural punishment hypothesis* (Johnson 2015), interindividual punishment involves a potential risk (e.g., the risk of retaliation), but belief in a supernatural observer who is always watching people and punishing norm violations, solves this

evolutionary problem. Because when someone violates traditional moral norms, the idea of supernatural monitoring will encourage people to stay in line. Overall, according to this view, religion emerged as an adaptation as it fostered interpersonal cooperation.

However, an opposing view claims that religion emerged as a by-product of other adaptations (Boyer 2001). According to this view, there are certain evolved adaptive cognitive features and abilities in our mind which emerged as adaptation such as the ability to mentalize. As a by-product of believing that other people have independent minds, belief in nonphysical supernatural agents has emerged. According to this idea, we can mentalize supernatural beings such as jinn, angels, and devils in our minds, just as we are aware that other human beings have mental states. When Gould and Lewontin (1979) first proposed the idea of evolutionary by-products (i.e., spandrels) in their famous article written in 1979, they claimed that it may not be a secondary feature. Instead, they claimed that a feature that emerges as a by-product could later come to have an adaptive function, often referred to as “exaptation.” According to this idea, even if religious belief has emerged as a by-product, it can be construed as an exaptation since it later gains an adaptive function and encourages cooperation among people.

One of the most popular disputes on adaptation/by-product distinction has taken place in the area of the evolution of language. Noam Chomsky has argued that language and universal language faculty emerged as a kind of by-product (Hauser et al. 2002). According to this view, language emerges as a kind of by-product of the development and complexity of the brain. However, a group led by Steven Pinker and Jack Jackendoff argue that Chomsky’s statement is not very convincing, and language can be an adaptation itself due to its various adaptive benefits (Pinker and Jackendoff 2005). According to this view, language has emerged as an adaptation on its own in terms of its functional solutions in issues such as low-risk punishment (i.e., gossip), interpersonal cooperation, and child-rearing. Therefore, it can be concluded that deciding

what is an adaptation and what is a by-product is difficult, especially in evolutionary psychology.

The moral foundations theory (Haidt 2012), which led to a paradigmatic change in the field of moral psychology, also explains morality through evolved adaptations. According to the moral foundations theory, there are five different intuitive foundations (harm, justice, loyalty, authority, holiness), each of which has its own evolutionary function. The care/harm foundation is defined as the behavior shown by other group members to the weaker group member in need of protection or care. The fairness/cheating, on the other hand, is the moral sensitivity that is required to ensure justice and maintain order within the group. The loyalty/betrayal has been defined as protecting the interests of the group without betrayal. The authority/subversion is defined as another moral sensitivity that is important for mammalian groups living a hierarchical social structures. Finally, the sanctity/degradation describes a moral sensitivity that is thought to have evolved due to a sensitivity to disgust. This alleged evolutionary adaptation, protecting the environment necessary for clean living in natural life and keeping group members away from diseases caused by microbes and bacteria, also affects the moral sensitivity of people. However, since the mechanisms proposed by evolutionary psychologists rarely meet the necessary criteria of identifying a trait as an adaptation, future empirical work, especially in genetics, are warranted to reach a clear conclusion.

Cross-References

► [Adaptation](#)

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