

Evolutionary Psychology

Evolutionary psychology is a recent approach to understanding human psychology that takes as its starting place the fact that minds, just like hearts, kidneys, eyes, and thumbs, are the products of evolution. As banal as this point may seem, evolutionary psychologists believe that an evolutionary perspective on psychology implies an array of ontological and methodological commitments that sharply distinguishes evolutionary psychology from other scientific theories of mind. Among the more important of these commitments are that minds consist of many (thousands, according to some) domain-specific modules that arose as adaptations during the Pleistocene epoch (roughly 1.8 million years b.p. until 11.5 thousand years b.p.). These adaptations are common to all human beings, and thus constitute a human nature. Study of these adaptations requires hypotheses about features of the environment of evolutionary adaptedness (EEA), as well as about which psychological properties exhibit design. Most celebrated by evolutionary psychologists are the discoveries evolutionary psychologists have made in the areas of mate preferences, social exchange, and parent-offspring conflict. Critics have charged that evolutionary psychology is untestable because hypotheses about the EEA cannot be tested, that evolutionary psychology is adaptationist to a fault, and that commitment to the existence of a human nature is inconsistent with evolutionary theory.

1 Ontological commitments of evolutionary psychology

Brain size in the genus *homo* began to increase roughly 2 million years ago, which corresponds, also roughly, to the beginning of the Pleistocene epoch. Because the time between the end of the Pleistocene and the present day is too brief (a period of only about 550 human generations) to have allowed much human evolution, it will have been during the Pleistocene that modern human psychological traits evolved. Thus, the characteristics of human minds bear

an imprint of the Pleistocene environment. This fact, evolutionary psychologists believe, entails certain consequences for human psychology.

Among these commitments is that human minds consist of many, perhaps thousands, of domain-specific modules, each designed by natural selection in a way that will maximize the reproductive success of the genes that produce them. Moreover, because these modules are adaptations that have moved to fixation in the human population, they are features of a universal human psychology. Let us examine these claims in turn.

Our Pleistocene ancestors faced numerous selection pressures. Evolutionary psychologists refer to the selection pressures and problems that confronted our ancestors as the environment of evolutionary adaptedness (EEA). The EEA was not a fixed time or place. Rather, it was the amalgam of changing geological, climatic, biotic, and, most importantly, social conditions that had an impact on human survival. Some features of the human EEA might be identical to features of other organisms' EEAs. For example, our ancestors, as well as many other organisms, had to find food, distinguish safe from toxic food, and raise offspring. However, there were elements of the human EEA that generated specifically human psychological adaptations. Human female ovulation is undetectable. Thus, reproductively successful males were those who developed adaptive strategies to respond to hidden ovulation. Human beings lived in social groups and sometimes benefited from the exchange of goods with members of their groups. Thus, those human beings who developed the means by which to detect whether they were being cheated would be fitter than those who did not. Similarly, those who adopted an attitude of xenophobia toward members of other groups may have been spared aggressive encounters.

The list of problems our ancestors faced in the EEA must be incredibly long: avoiding incest, avoiding toxic foods, finding nutritious food, defeating aggressors, choosing a mate, caring for children, inferring what others are thinking, preventing (or producing) deception, gaining and keeping status, planning for the future, identifying predators, preventing cuckoldry, and on and on. Each of these problems demands a solution that cannot serve as a solution to other problems. In this way, psychological adaptations show their similarity to more familiar anatomical and physiological adaptations. Lungs have the function of introducing oxygen into the bloodstream, but they do not pump blood. Hands grasp, but feet do not. Some teeth are specialized for tearing and others for grinding. Just as natural selection has crafted anatomical and physiological traits for precise ends, so too the evolutionary psychologist expects that psychological adaptations will be singularly dedicated to solving very particular kinds of problems. Thus, there will be special collections of circuits in the brain – modules – that are each devoted to processing particular kinds of information. For instance, evolutionary psychologists have claimed that there is a module for the detection of sexual rivals (e.g. Buss, Shackelford, Choe, Buunk, and Dijkstra 2000). This module presumably contains within it rules about how to identify someone as a sexual rival and what actions to take to prevent this rival from winning over one's mate. In this sense, human beings come equipped with a jealousy module. The system is modular because it is a devoted piece of computational machinery that interacts with other modules only through clearly defined interfaces, and it is domain-specific because it processes and responds only to information about sexual rivals and not about, e.g. toxic food or predators.

In short, evolutionary psychology conceives the mind as comprising many such modules, each one tailored to the solution of a particular adaptive problem that confronted our ancestors in

the EEA. These modules constitute a collection of psychological instincts that in many cases act as automatically as the reflexes that keep flying particles from injuring our eyes, or food from being aspirated.

The obvious contrast to a modular, domain-specific mind is the conception of mind that comes to us from the empiricist tradition. On the empiricist view, the mind is a blank slate, which is to say that it comes empty of any capacities to recognize particular objects or circumstances. It contains no knowledge of how to choose between good and poor mates, cheater and friend, predator and prey. Moreover, unlike the evolved mind, in which computational circuits customize their processing to the specific kinds of information to which they have been designed to respond, the empiricist mind relies on the same broad cognitive skills – memory, attention, problem solving, reasoning – when considering content within any domain. In contrast, evolutionary psychologists predict, and their data support the thesis, that human capacities to recognize, remember, and attend will differ depending on subject matter. For instance, human beings are very good at recognizing and remembering faces, but not nearly so good at recognizing and remembering abstract geometrical designs. Presumably, this difference is owing, on the one hand, to the clear adaptive benefit accruing to one who can recognize members of his or her social group and, on the other hand, to the relative unimportance of being able to recognize abstract geometrical designs.

When evolutionary psychologists claim that the domain-specific modules that constitute the mind are adaptations, they mean that natural selection has been the main or exclusive cause for their existence. This is a strong thesis, for natural selection need not always play the most significant role in a trait's evolution. Some traits evolve simply because they are byproducts of traits for which there is selection (Gould and Lewontin 1979). These “spandrels” are typically a

necessary consequence of introducing new traits into an exquisitely integrated collection of previously existing traits, but there are simple examples as well. Thus, the greenness of leaves is a byproduct of the presence of chlorophyll, for which there was selection. Similarly, belly buttons are anatomical features that serve no function but are the necessary consequence of an umbilical attachment. We will see below that evolutionary psychologists have been criticized for thinking that all psychological traits, or all *interesting* psychological traits, are adaptations.

But there is more to be said about adaptations. Adaptations are so-called because they modify their possessors in a beneficial way. Because adaptations are beneficial, their possessors will be fitter than those lacking the adaptation, and over time (but not always), all members of the population will possess the adaptation. But this account of evolution leaves unidentified the unit of selection, i.e. the beneficiary of the adaptation whose benefiting causes the evolution of the adaptive trait. For the most part, Darwin thought that adaptations evolve as a result of their benefit to individuals. The lion's sharp claws benefit the lion. Many evolutionary psychologists, however, believe that the gene is the only unit of selection (there are exceptions, notably Boyd and Richerson 1985). Any benefit that sharp claws confer on a lion are also conferred on the genes that code for the proteins from which the claws are constructed. This endorsement of the selfish gene thesis (see Dawkins 1976), although widespread among evolutionary psychologists, seems tangential to the main goals and interests of evolutionary psychology, and at any rate is certainly not implied by the assumption that psychological traits are adaptations. A psychological trait can benefit a cluster of genes while at the same time benefiting an individual, and there appears to be no reason to limit an adaptation's bounty to a single kind of entity. Moreover, there is nothing to prevent an adaptive psychological trait from benefiting a group of non-related conspecifics. As various models of group selection have revealed, altruistic

psychological traits can evolve (see especially Sober and Wilson 1998), and their existence needn't pose any threat to the evolutionary psychologist's belief that the mind consists of domain-specific, modular adaptations.

One final point about adaptations will conclude this section on the ontological commitments of evolutionary psychology. Most or all psychological traits, evolutionary psychologists believe, have zero heritability. This is because heritability, within evolutionary biology, is defined as the proportion of phenotypic variation in a population that is a product of genetic variation. When there is no phenotypic variation in a trait, there will consequently be no heritability of the trait (although the trait was heritable during its period of evolution).

Adaptations are more likely to have low heritability because traits that increase fitness will often move to fixation in a population. For example, opposable thumbs have nearly zero heritability within human beings. On the other hand, traits like body hair, height, nose size, and eye color have considerable heritability. This can be explained on the assumption that these latter traits do not confer any, or any significant, selective advantage. They are free to vary without making much difference to the fitness of their possessors.

The idea that psychological adaptations have zero heritability leads evolutionary psychologists to defend the existence of a human nature. Because all or almost all psychological traits are adaptations, and because all or most adaptations will be shared by all members of a population, all or almost all human beings will have the same collection of domain-specific psychological modules. The most obvious exceptions to this shared human nature that evolutionary psychologists acknowledge are the differences one finds between male and female psychologies. However, we should still expect, evolutionary psychologists believe, that there is

a common human nature that men and women share, and on top of this base there will exist a male human nature and a female human nature.

2 Methodological commitments of evolutionary psychology

The explanatory goal of evolutionary psychology is a description of the domain-specific modules that evolved as adaptations to the selection pressures in the EEA. This description will entail first the discovery of the modules themselves, which involves a functional description of the module, and second an information-processing account of how the modules perform their functions. Evolutionary psychologists are careful to point out that their subject matter is not human *behavior*, e.g. running from predators, eating nutritious food, choosing fertile mates, because behavior is not an adaptation. Behavior cannot be an adaptation because behavior is not heritable. Indeed, there are many behaviors that an organism will never exhibit despite having a domain-specific mechanism that would trigger the behavior in appropriate circumstances. Thus, the evolutionary psychologist's focus is on the proximate causes of behavior, i.e. the domain-specific modules that persist and evolve through generations.

The primary explanatory strategy in evolutionary psychology is the task (or functional) analysis. The strategy begins with an attribution of a function to the target of one's analysis. The function assignment then guides an analysis of the target capacity into simpler capacities. The resulting analysis counts as an explanation of the target because it describes how the behavior of the target is produced by the interaction of its simpler components. The assumption that psychological traits are adaptations that evolved in the EEA provides a means by which to constrain task analyses, thereby enhancing their effectiveness.

For example, in providing a task analysis of a grandfather clock, one starts with the assumption that the clock's mechanism has the purpose of keeping time. This function

assignment guides subsequent analysis, revealing why the pendulum is the length that it is, why the escapement gear has the number of teeth it does, why the gear train has the ratio it does, and so on. Indeed, knowledge that the clock is designed to tell time allows one to predict the number of teeth on the escapement gear given the period of the pendulum. Without knowing that the mechanism in the clock is designed to tell time, the facts listed in the task analysis of the grandfather clock lack unity – their relationship to each other is simply brute.

Grounding the function assignments on which evolutionary psychologists depend for their analyses of psychological modules are assumptions about the selection pressures that our Pleistocene ancestors faced. Some of these assumptions emerge purely from speculation about what the EEA must have been like and how our ancestors must have evolved given that they successfully reproduced. For instance, it is a very safe bet that our ancestors must have developed adaptations for hunting, gathering, mate selection, incest avoidance, parental care, and cooperation. Of course, simply knowing that our ancestors faced competition for mates does not reveal much about the psychological adaptations that evolved in response to this problem. However, evolutionary psychologists can test hypotheses about the adaptive functions of psychological modules by collecting observations about current human behavior. Because psychological modules cause behavior that would have been adaptive in the EEA, experiments designed to reveal this behavior will provide evidence about the function of the module. Thus, evolutionary psychologists have performed studies that purport to show that men fantasize about sex more than women and prefer nubile, promiscuous women when seeking brief sexual encounters; women are attracted to strong, broad-chested men of high status; application of *modus tollens* is easier in contexts of social exchange than it is when reasoning about abstract matters; people report disgust at the idea of incest; there is a higher incidence of violence

between children and their stepfathers than between children and their biological fathers, and so on. These facts constitute the evidence that will support or disconfirm hypotheses about the functions of psychological modules.

Because of the role behavioral evidence plays in a task analysis, it is also sometimes possible to use this evidence to inspire a search for a psychological adaptation that one would not have otherwise expected. This is especially clear in cases like phobias. People fear snakes, darkness, closed spaces, heights, and storms. Evolutionary psychologists argue that these phobias are too universal and too well-designed to be anything but the products of psychological adaptations to particular selection pressures in the EEA. They wear their functions on their sleeves. Similarly, one might wonder whether the Cinderella effect (Daly and Wilson 1998, 2005), in which a stepfather exhibits more violent behavior toward his stepchildren than to his genetically related children, is an adaptation. Assuming that the Cinderella effect is real (this is controversial: see Daly and Wilson 2001), one can begin to investigate evolutionary explanations for it, relying on data about the effect to inspire hypotheses about the function of the module that produces it, which in turn will generate predictions that will either support the functional hypothesis at hand or suggest superior alternative hypotheses.

The idea of a task analysis of course pre-dates Darwin's theory of evolution by natural selection. Indeed, William Harvey's discovery of the heart's function, which also relied on a task analysis, preceded publication of Darwin's *On the Origins of Species* by almost 250 years. This shows that one can make effective use of functional ideas without having to ground them in natural selection. However, evolutionary psychologists argue that appreciation of the evolutionary history of human psychology is essential for its explanation because the human mind is equipped with adaptations that are not always adaptive in the current environment. The

modules that constitute human psychology had moved to fixation roughly by the end of the Pleistocene epoch. This means that human psychology is adapted to an environment that did not include agriculture, industry, or sophisticated technology. Failure to situate psychological traits in the EEA will hamper our ability to explain them, preventing a proper understanding of what they are supposed to do. A favorite example of this is the sweet tooth, which was once adaptive, but in today's world of Cinnabon and Ben and Jerry's is now maladaptive.

3 Criticisms of Evolutionary Psychology

Evolutionary psychology has generated considerable heat, but it is important to distinguish the personalities involved in these disputes from the tenability of the research program itself. Some of the most prominent evolutionary psychologists have undoubtedly ruffled feathers with grandiose claims about the revolution that evolutionary psychology portends, and the new paradigm in psychology that it creates. Talk of paradigms cannot help but invoke Thomas Kuhn's notion of a paradigm, and evolutionary psychology clearly fails to meet Kuhn's criteria for a new paradigm. On the other side, some critics of evolutionary psychology have used their positions of public celebrity to accuse evolutionary psychologists of very fundamental misunderstandings of evolutionary theory – misunderstandings that properly trained high school students would never make. Ultimately, the success of evolutionary psychology will depend on its ability to establish the existence and illuminate the workings of the psychological modules it proposes. There is presently some very compelling research toward this end, and one must keep in mind that evolutionary psychology in its current form is only decades old. With these caveats in place, it is time to consider some criticisms of evolutionary psychology.

Some critics have argued that claims about the EEA are untestable and so hypotheses derived from speculation about the EEA are unscientific (Gould 1997). Others have argued that

the EEA was too unstable to produce psychological modules of the sort that evolutionary psychologists describe (Buller 2005). Charges of untestability are ambiguous. They might mean that there is no possible test that could be performed to distinguish between two competing hypotheses. Were this true of hypotheses about the EEA then evolutionary psychology would indeed face a difficult problem. If hypotheses are untestable in principle, then they surely are beyond the reach of scientific investigation. However, if the charge of untestability means only that hypotheses about the EEA are *in practice* very difficult to test, then evolutionary psychology is no worse off than many other theories. For instance, although Einstein's general theory of relativity received early support in its successful prediction of the perihelion precession of Mercury's orbit, it was not until 1959 – forty four years after the theory's introduction – that the Pound-Rebka experiment measuring the gravitational redshift of light provided very strong experimental support for the theory. Evolutionary psychologists expect that continuing paleoanthropological investigations as well as studies of primitive hunter-gatherer societies will provide the data necessary to offer well-supported conjectures about aspects of the EEA. Additionally, evolutionary psychologists believe themselves to be on safe ground in conjecturing that our Pleistocene ancestors must have had to avoid toxic foods, fend off sexual rivals, find fertile and cooperative mates, protect their offspring, etc.

More serious than the charge of untestability is the possibility that the EEA did not offer sufficient recurrent structure to select for domain-specific psychological adaptations (Buller 2005). Features of the environment can shape adaptations only if they remain stable for an extended period of time. Some features of the environment, like gravity, sunlight, and water density are extremely stable, and it will come as no surprise that organisms have evolved adaptations to solve the problems that these things present to survival. Other features of the

environment, like fruit and predatory felines, have been present in our evolutionary history long enough to make reasonable the expectation that we have developed adaptations in response to each. However, some critics have argued that the selection pressures inherent in social living, which, according to the well-regarded Machiavellian intelligence hypothesis (Byrne and Whiten 1988), are the pressures that have been most important in shaping our psychology, are quite volatile and thus not pressures to which our ancestors could have evolved adaptations.

The idea of an evolutionary arms race illustrates this problem clearly. Such races are commonplace between predator and prey or parasites and their hosts. Due to parasitism, hosts might evolve adaptations that prevent further parasitism. In response, parasites will evolve adaptations to overcome the hosts' preventive adaptations and the host, consequently, will be forced to evolve new preventive adaptations. In like manner, the critic charges, social selection pressures will forever be in flux as members of society evolve ever more sophisticated adaptations to insure their reproductive success. Cheaters will learn to become better liars in response to their detection, lie detection will improve in order to defeat these superior liars, and the arms race will continue, producing better and better liars in response to better and better detectors.

The force of this objection is unclear. Suppose it is true that our ancestors had been engaged in various psychological arms races as a result of communal living. This does not show that they did not evolve psychological adaptations. Indeed, the very idea of an arms race assumes the evolution of numerous adaptations, always increasing in sophistication. The ability to detect cheaters is an adaptation, as is the ability to cheat more successfully, so the criticism cannot be that arms races prevent adaptation.

At best, the criticism seems to highlight the difficulty involved in isolating the selection pressures in the EEA that define the functional capacities of psychological adaptations. If the selection pressures are always changing, then the functions of our psychological modules are moving targets. Nonetheless, it is possible that evolution has finished, for the time being, with our psychology. Perhaps the arms races that formed our psychological mechanisms have come to an end. This might be the case if our psychological functions correspond to evolutionarily stable strategies – strategies that additional modification can only worsen. Alternatively, arms races can end if variations for improved strategies never surface. After all, natural selection can choose only among existing variants. Whatever the case, the fact that part of the environment in which human psychology evolved was itself an environment of evolving psychological capacities makes investigation of the results of this process no more impossible than an analysis of other products of arms races like frog mating calls, running speeds in wolves and deer, or lightning bug displays.

A second charge that critics raise against evolutionary psychology is that it is adaptationist (Gould 1997). The charge is clearly correct, but the onus falls on the critic to explain why this adaptationism is objectionable. At this point, the criticism begins to take on the flavor of the one above. To demonstrate that something is an adaptation, the critic argues, one must know which selection pressures were actually present in the EEA, and which had a hand in crafting a particular trait. But, the critic continues, one can only guess about these matters, and any such guesses will be untestable.

Insofar as this objection resembles the first one, the response is similar. No one said that evolutionary psychology would be easy. Establishing that a particular trait is an adaptation is a difficult task. However, biologists have developed techniques, like optimality modeling, that

have been useful in identifying adaptations. There is no obvious reason why evolutionary psychologists cannot avail themselves of similar techniques. The hypothesis that men have an adaptation that causes them to be most attracted to women of maximum reproductive value certainly yields predictions. Moreover, as in any optimality modeling, if the behavior of real men fails to correspond precisely to the behavior a model predicts, one can then investigate reasons for this divergence. There is, of course, no guarantee that an optimality model will correctly identify a trait as an adaptation, but science is rarely in the position to provide certainty.

A final criticism of evolutionary psychology concerns the claim that evolution has produced a universal psychology – a human nature. Part of the difficulty of this claim is simply determining what is meant by a human nature. Within philosophy, natures are linked with essences, which confront famous criticisms of essentialist thinking by philosophers as diverse as Wittgenstein and Quine. Moreover, Elliott Sober (1980) has persuasively argued that essentialist thinking is antithetical to evolutionary theory, which abandons the idea that there is a “normal” species-defining phenotype in favor of the idea that within any species there is a range of possible phenotypes depending on environmental influences, no one of which is more or less normal than any other.

Another problem facing the claim that humans share a common psychology is the obvious fact of psychological variance among humans. Some human beings are optimistic and others pessimistic. Some are extroverted and others introverted. Some are good at mathematical and abstract reasoning, others are artistic but unable to balance their check books. One way to explain away these obvious psychological differences is to attribute them to differences in environment. The evolutionary psychologist might claim that human beings share a common store of psychological modules, but that differences in environment will cause them to produce

different psychological profiles. This response will remind some of Chomsky's explanation for why people speak different languages despite sharing a universal grammar. This universal grammar contains parameters that are switched one way or another depending on the infant's linguistic environment, and this is why Tak Jun ends up speaking Cantonese while Pierre grows up speaking French.

One objection to this response is that it misinterprets the proper domain of psychology. Suppose it is true that human beings share the same domain-specific modules but that differences in environment can cause these modules to produce vastly different psychologies: different cognitive abilities, emotional intelligences, life goals, and so on. The critic might reasonably respond that these things – cognitive abilities, emotional intelligences, life goals – are what constitute a person's psychology (Buller 2005). If people differ with respect to things like these, then they *do* differ psychologically, regardless of whether they share domain-specific modules. Analogously, it seems reasonable to deny that there is a universal human skin color even if it is true that skin color is caused by the same kinds of mechanisms in all human beings.

A final objection to the idea of a universal psychology is that the claim is ultimately an empirical one that will depend on whether some psychological differences can co-exist in a stable polymorphism. Biologists have long known about polymorphisms in which one or more distinct genotype can persist in a population. Polymorphisms can come about when a heterozygous genotype is the fittest combination of alleles. Because heterozygotes do not breed true, a population in which a heterozygous genotype is fittest will always contain homozygous genotypes as well. Alternatively, game theorists have described situations in which two or more strategies for interaction (e.g. varieties of "hawk" and "dove" strategies) form an evolutionarily stable state. In this case, the distinct strategies will persist in the population. These examples

suffice to show that there is no *a priori* reason why human beings cannot be equipped with different kinds of psychological modules.

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