1

FOUNDATION OF EVOLUTIONARY PSYCHOLOGY - I

Unit Structure

1.0 OBJECTIVES

After studying this chapter, the reader will be able to understand

- Darwin's Theory of Natural Selection
- Darwin's Theory of Sexual Selection
- Movements and Controversies in Evolutionary Thinking
- Common Misunderstandings about Evolutionary Theory
- Origins of human nature, evolutionary game theory
- Key products of evolution
- Concept of "evolved psychological mechanism."
- Methods for testing evolutionary hypotheses
- Data sources for testing evolutionary hypotheses.

1.1 INTRODUCTION

Evolutionary psychology is a theoretical approach to psychology that attempts to explain useful mental and psychological traits—such as memory, perception, or language—as adaptations, i.e., as the functional products of natural selection.

Evolutionary psychology is focused on how evolution has shaped the mind and behaviour. Most research in evolutionary psychology focuses on humans.

Evolutionary Psychology proposes that the **human brain comprises many functional mechanisms, called psychological adaptations** or evolved cognitive mechanisms designed by the process of natural selection. Examples include language acquisition modules, incest avoidance mechanisms, cheater detection mechanisms, intelligence and sex-specific mating preferences, alliance-tracking mechanisms, and so on.

Evolutionary psychology has roots in cognitive psychology and evolutionary biology.

It also encompasses behavioural ecology, artificial intelligence, genetics, ethology, anthropology, archaeology, biology, and zoology. It is also linked to socio-biology.

What Is Evolutionary Psychology?

The human body evolved over thousands of years, slowly calibrating to the African savannah on which 98 percent of human ancestry lived and died. According to evolutionary psychologists, the mind is shaped by the pressure to survive and reproduce; emotions, communication skills, and language ability are adaptations that enabled ancestors to thrive.

Many of the behaviours humans exhibit have been tools for self-preservation: People jealously guard their romantic partners, and competition for mates has always been harsh. Everyone cherishes their closest kin; preserving genes is in one's best interest. Humans also crave social interaction to encourage cooperation, further increasing the chances for survival. Many of these behaviours are innate; often how people react and interact with one another is spelt out in DNA.

Helping to Explain Who We Are:

Our emotional complexity helps differentiate us from other members of the animal kingdom. Evolutionary psychology seeks to explain how our emotions and other aspects of being human served the advantages of our ancestors. Like other social primates, we experience emotions beyond primal fear and anger—through evolving as a group, we have developed empathy and altruism, which allow us to commiserate with each other's situations and act in ways that are not self-serving.

We have also developed emotions to help keep us in line, forexample, shame motivates us to atone for past transgressions, while pride pushes us to remain in high regard by our peers. As our social structures developed, so did our value systems—what we define as "right" and "wrong."

Evolutionary Psychology & Human Behaviour:

Evolutionary psychology is a scientific discipline that approaches human behaviour through a lens that incorporates the effects of evolution. It combines the science of psychology with the study of biology. Evolutionary psychologists seek to explain people's emotions, thoughts, and responses based on Charles Darwin's Theory of Evolution Through Natural Selection.

1.2 LANDMARKS IN THE HISTORY OF EVOLUTIONARY THINKING

Evolution before Darwin:

Evolution refers to change over time. Change in life forms was postulated by scientists to have occurred long before Darwin published his classic 1859 book *On the Origin of Species*.

Jean Baptiste Lamarck (1744–1829) was one of the first scientists to recognize the study of life as a distinct science. Lamarck believed in two major causes of species change: first, a natural tendency for each species to progress toward a higher form and, second, the inheritance of acquired characteristics.

Lamarck proposed that animals must struggle to survive and this struggle causes their nerves to secrete a fluid that enlarges the organs involved in the struggle. Giraffes evolved long necks, he thought, through their attempts to eat from higher and higher leaves.

Lamarck believed that the neck changes were passed down to succeeding generations of giraffes, hence the phrase "the inheritance of acquired characteristics."

Biologists before Darwin also noticed the variety of species, some with astonishing structural similarities. Humans, chimpanzees, and orangutans, for example, all have exactly five digits on each hand and foot. The wings of birds are similar to the flippers of seals, perhaps suggesting that one was modified from the other (Daly & Wilson, 1983). Comparisons among these species suggested that life was not static, as some scientists and theologians had argued. Further evidence suggesting change over time also came from the fossil record. Bones from older geological strata were not the same as bones from more recent geological strata. These bones would not be different, scientists reasoned, unless there had been a change in organic structure over time.

Another source of evidence came from comparing the embryological development of different species (Mayr, 1982). Biologists noticed that such development was strikingly similar in species that otherwise seemed very different from one another. An unusual loop-like pattern of arteries close to the bronchial slits characterizes the embryos of mammals, birds, and frogs. This evidence suggested, perhaps, that these species might have come from the same ancestors millions of years ago. All these pieces of evidence, present before 1859, suggested that life was not fixed or unchanging. The biologists who believed that life forms changed over time called themselves evolutionists.

Another key observation had been made by evolutionists before Darwin: Many species possess characteristics that seem to have a purpose. The porcupine's quills help it fend off predators. The turtle's shell helps to protect its tender organs from the hostile forces of nature. The beaks of many birds are designed to aid in cracking nuts. This apparent functionality, so abundant in nature, required an explanation.

Missing from the evolutionists' accounts before Darwin, however, was a theory to explain how change might take place over time and how such seemingly purposeful structures such as the giraffe's long neck and the porcupine's sharp quills could have come about. A causal process to explain these biological phenomena was needed. Charles Darwin provided the theory of just such a process.

1.2.1 Darwin's Theory of Natural Selection:

Darwin not only wanted to explain *why* change takes place over time in life forms, but also to account for the particular ways it proceeds. He wanted to determine how new species emerge (hence the title of his book *On the Origin of Species*), as well as why others vanish or go extinct. Darwin wanted to explain why the component parts of animals—the long necks of giraffes, the wings of birds, and the trunks of elephants—existed in those particular forms. And he wanted to explain the apparent purposive quality of those forms, or why they seem to function to help organisms accomplish specific tasks.

The answers to these puzzles can be traced to a voyage Darwin took after graduating from Cambridge University. He travelled the world as a naturalist on a ship, the *Beagle*, for a five-year period, from 1831 to 1836. During this voyage, he collected dozens of samples of birds and other animals from the Galápagos Islands in the Pacific Ocean. On returning from his voyage, he discovered that the Galápagos finches, which he had presumed were all of the same species, actually varied so much that they constituted different species. Indeed, each island in the Galápagos had a distinct species of finch.

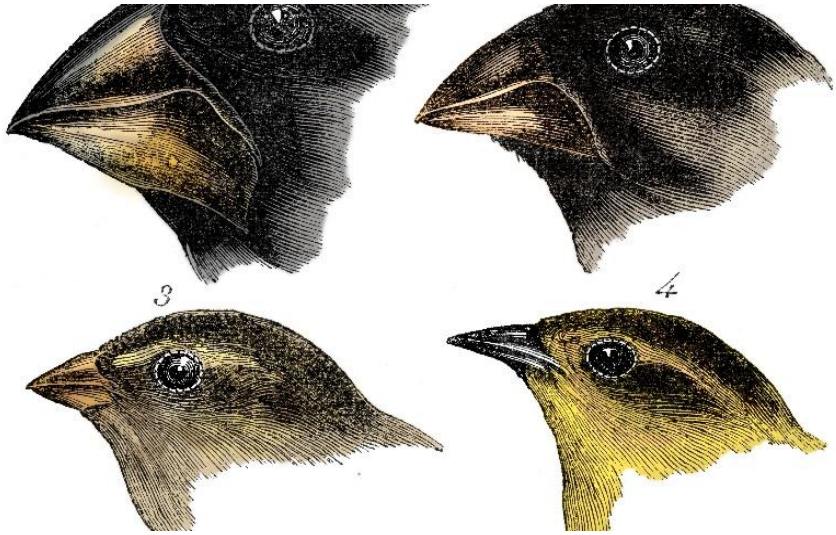

Figure 1.1: Finches on Galapagos Island (see the difference in beak shape)

Source: https://www.thoughtco.com/charles-darwins-finches-1224472

Darwin determined that these different finches had a common ancestor but had become different from each other because of the local ecological conditions on each island. This geographic variation was pivotal to Darwin's conclusion that species are not immutable but can change over time.

What could account for why species change? Darwin struggled with several different theories of the origins of change, but rejected all of them because they failed to explain a critical fact: the existence of adaptations. Darwin wanted to account for change, of course, but he also wanted to account for why organisms appeared so well designed for their local environments.

Darwin unearthed a key to the puzzle of adaptations when he found that organisms exist in numbers far greater than can survive and reproduce. The result must be a "struggle for existence," in which favourable variations tend to be preserved and unfavourable ones tend to die out. When this process is repeated generation after generation, the end result is the formation of new adaptation.

Darwin's answer to all these puzzles of life was the theory of *natural selection* and its three essential ingredients: *variation, inheritance,* and *differential reproductive success.* First, organisms vary in all sorts of ways, such as in wing length, trunk strength, bone mass, cell structure, fighting ability, defensive ability, and social cunning. Variation is essential for the process of evolution to operate—it provides the "raw materials" for evolution.

Second, only some of these variations are inherited—that is, passed down reliably from parents to their offspring, who then pass them on to their offspring down through the generations. Other variations, such as a wing deformity caused by an environmental accident, are not inherited by

offspring. Only those variations that are inherited play a role in the evolutionary process.

The third critical ingredient of Darwin's theory is selection. Organisms with some heritable variants leave more offspring *because* those attributes help with the tasks of *survival* or *reproduction.* In an environment in which the primary food source might be nut-bearing trees or bushes, some finches with a particular shape of beak, for example, might be better able to crack nuts and get at their meat than finches with other shapes of beaks. More finches who have beaks better shaped for nut cracking survive than those with beaks poorly shaped for nut cracking.

An organism can survive for many years, however, and still not pass on its inherited qualities to future generations. To pass its inherited qualities to future generations, it must reproduce. Thus, *differential reproductive success*, brought about by the possession of heritable variants that increase or decrease an individual's chances of surviving and reproducing, is the "bottom line" of evolution by natural selection. Differential reproductive success or failure is defined by reproductive success relative to others. The characteristics of organisms that reproduce more than others, therefore, get passed down to future generations at a relatively greater frequency. Because survival is usually necessary for reproduction, it took on a critical role in Darwin's theory of natural selection.

1.2.2 Darwin's Theory of Sexual Selection:

Darwin observed several inconsistencies that seemed to contradict his theory of natural selection. First, he noticed structures that seemed to have absolutely nothing to do with survival; the beautiful wings of peacocks were a prime example. How could this strange structure possibly have evolved? This was obviously costly to the peacock. Furthermore, it seems like an open invitation to predators.

Darwin also observed that in some species, the sexes differed dramatically in size and structure. Why would the sexes differ so much, Darwin wondered, when both males and female confront essentially the same problems of survival, such as eating, fending off predators, and combating diseases?

Darwin's answer to these apparent contradictions to the theory of natural selection was to devise a second evolutionary theory: the theory of *sexual selection.* In contrast to the theory of natural selection, which focused on adaptations that have arisen as a consequence of successful survival, the theory of sexual selection focused on adaptations that arose as a consequence of successful mating. Darwin proposed two primary means by which sexual selection could operate. The first is *intrasexual competition*—competition between members of one sex, the outcomes of which contributed to mating access to the other sex. The prototype of intrasexual competition is two stags locking horns in combat. The victor gains sexual access to a female either directly or through controlling territory or resources desired by the female. The loser typically fails to mate. Whatever qualities lead to success in the same-sex contests, such as

greater size, strength, or athletic ability, will be passed on to the next generation because of the mating success of the victors.

Qualities that are linked with losing fail to get passed on. So evolution—change over time—can occur simply as a consequence of intrasexual competition.

The second means by which sexual selection could operate is *intersexual selection*, or preferential mate choice. If members of one sex have some consensus about the qualities that are desired in members of the opposite sex, then individuals of the opposite sex who possess those qualities will be preferentially chosen as mates. Those who lack the desired qualities fail to get mates. In this case, evolutionary change occurs simply because the qualities that are desired in a mate increase in frequency with the passing of each generation. If females prefer to mate with males who give them gifts of food, for example, then males with qualities that lead to success in acquiring food gifts will increase in frequency over time. Darwin called the process of intersexual selection *female choice* because he observed that throughout the animal world, females of many species were discriminating or choosy about whom they mated with.

Darwin's theory of sexual selection succeeded in explaining the anomalies that worried him. The peacock's tail, for example, evolved because of the process of intersexual selection: Peahens prefer to mate with males who have the most brilliant and luminescent plumage. Males are often larger than females in species in which males engage in physical combat with other males for sexual access to females—a sex difference caused by the process of intrasexual competition.

1.2.3 The Role of Natural Selection and Sexual Selection in Evolutionary Theory:

Darwin's theories of natural and sexual selection are relatively simple to describe, but many sources of confusion surround them even to this day.

First, natural selection and sexual selection are not the only causes of evolutionary change. Some changes, for example, can occur because of a process called ***genetic drift*****,** which is defined as random changes in the genetic makeup of a population. Random changes come about through several processes, including mutation (a random hereditary change in the DNA), **founder effects, and genetic bottlenecks**.

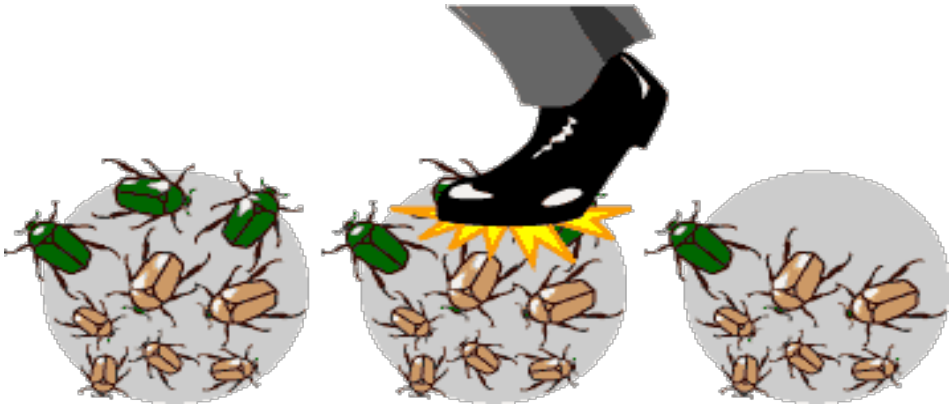

Figure 1.2: Genetic drift

Source: https://www.anthromania.com/2021/07/27/genetic-drift/

Founder effects occur when a small portion of a population establishes a new colony and the founders of the new colony are not genetically representative of the original population. Imagine, for example, that the 200 colonizers who migrate to a new island happen by chance to include an unusually large number of redheads. As the population on the island grows, say, to 2,000 people, it will contain a larger proportion of redheads than did the original population from which the colonizers came. Thus, founder effects can produce evolutionary change—in this example, an increase in genes coding for red hair.

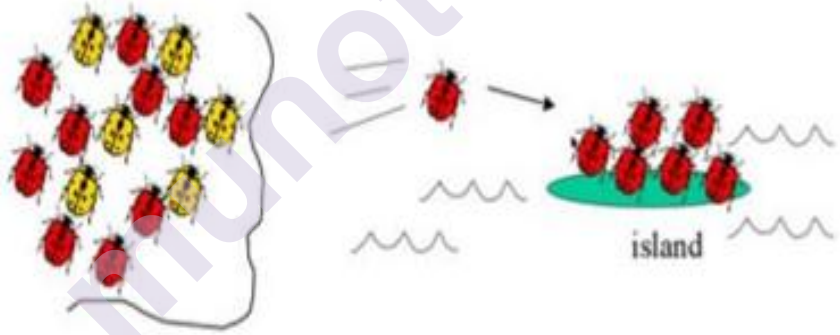

Figure 1.3: Founder effect

Source: https://www.guyhowto.com/founder-effect/

A similar random change can occur through **genetic bottlenecks**, which happen when a population shrinks, perhaps owing to a random catastrophe such as an earthquake. The survivors of the random catastrophe carry only a subset of the genes of the original population. In sum, although natural selection is the *primary* cause of evolutionary change and the only known cause of adaptations, it is not the only cause of evolutionary change. Genetic drift—through mutations, founder effects, and genetic bottlenecks—can also produce change in the genetic makeup of a population.

Figure1.4: Genetic bottleneck

Source: https://www.expii.com/t/what-is-the-bottleneck-effect-definition-examples-10503

Second, evolution by natural selection is not forward-looking and is not "intentional." The giraffe does not spy the juicy leaves stirring high in the tree and "evolve" a longer neck. Rather, those giraffes that, owing to an inherited variant, happen to have longer necks have an advantage over other giraffes in getting to those leaves. Hence they have a greater chance of surviving and thus of passing on their slightly longer necks to their offspring. Natural selection merely acts on variants that happen to exist. Evolution is not intentional and cannot look into the future and foresee distant needs.

Another critical feature of selection is that it is *gradual*, at least when evaluated

Relative to the human life span. The short-necked ancestors of giraffes did not evolve long necks overnight or even over the course of a few generations. It has taken dozens, hundreds, thousands, and in some cases millions of generations for the process of selection to gradually shape the organic mechanisms, we see today. Of course, some changes occur extremely slowly, others more rapidly. And there can be long periods of no change, followed by a relatively sudden change, a phenomenon known as "punctuated equilibrium"

(Gould & Eldredge, 1977). But even these "rapid" changes occur in tiny increments in each generation and take hundreds or thousands of generations to occur.

Darwin's theory of natural selection offered a powerful explanation for many baffling aspects of life. It explained the origin of new species. It accounted for the modification of organic structures over time. It accounted for the apparent purposive quality of the component parts of those structures—that is, they seemed "designed" to serve particular functions that contributed to survival or reproduction.

For the first time, each species was viewed as being connected with all other species through a common ancestry. Human beings and chimpanzees, for example, share more than 98 percent of each other's DNA and shared a common ancestor roughly 6 or 7 million years ago (Wrangham & Peterson, 1996). Another important fact was that many human genes turned out to have counterpart genes in a transparent worm called *Caenorhabditis elegans.* They are highly similar in chemical structure, suggesting that humans and this worm evolved from a distant common ancestor (Wade, 1997). In short, Darwin's theory made it possible to locate humans in the grand tree of life, showing their place in nature and their links with all other living creatures.

Objection to Darwin's Theory:

Darwin's theory of natural selection created lot of controversy. Royalties did not like the idea that their ancestors were apes. Even biologists at the time were highly sceptical of Darwin's theory of natural selection. One objection was that Darwinian evolution lacked a proper theory of inheritance. Darwin himself preferred a **"blending" theory of inheritance**, in which offspring are mixtures of their parents, much like pink paint is a mixture of red paint and white paint. This theory of inheritance is now known to be wrong, so early critics were correct in the objection that the theory of natural selection lacked a solid theory of heredity.

Another objection was that some biologists could not imagine how the early stages of wing help a bird, if a partial wing is insufficient for flight? How could a partial eye help a reptile, if a partial eye is insufficient for sight?

Darwin's theory of natural selection requires that each and every step in the gradual evolution of an adaptation be advantageous in the currency of reproduction. Thus, partial wings and eyes must yield an adaptive advantage, even before they evolve into fully developed wings and eyes.

A third objection came from religious creationists, many of whom viewed species as immutable (unchanging) and created by a deity rather than by the gradual process of evolution by selection.

The controversy continues to this day. Although Darwin's theory of evolution, with some important modifications, is the unifying and nearly universally accepted theory within the biological sciences, its application to humans still meets some resistance.

Genes and Particulate Inheritance:

When Darwin published *On the Origin of Species*, he did not know the nature of the mechanism by which inheritance occurred. An Austrian named Gregor Mendel showed that inheritance was "particulate," and not blended. That is, the qualities of the parents are not blended with each other, but rather are passed on intact to their offspring in distinct packets

called *genes*. Furthermore, parents must be born with the genes they pass on; genes cannot be acquired by experience.

Mendel's discovery that inheritance is particulate, which he demonstrated by crossbreeding different strains of pea plants, remained unknown to most of the scientific community for some thirty years.

The Modern view discarded a number of misconceptions in biology, including the blending theory of inheritance. It confirmed the importance of Darwin's theory of natural selection, but put it on a firmer footing with a well-articulated understanding of the nature of inheritance.

1.3 MOVEMENTS AND CONTROVERSIES IN EVOLUTIONARY THINKING

The Ethology Movement:

We can easily see how a turtle's shell is an adaptation for protection and a bird's wings an adaptation for flight. We recognize similarities between ourselves and chimpanzees, and so most people find it relatively easy to believe that human beings and chimps have a common ancestry. The paleontological record of skulls reveals that change has taken place over time. The evolution of behaviour, however, has historically been more difficult for scientists and laypeople to imagine. Behaviour, after all, leaves no fossils, at least not directly.

Darwin thought his theory of natural selection to be just as applicable to behaviour, including social behaviour, as to physical structures. Several lines of evidence support this view. First, all behaviour requires underlying physical structures. Bipedal locomotion is a behaviour, for example, and requires the physical structures of two legs and muscles to support those legs. Second, species can be bred for certain behavioural characteristics using the principle of selection. Dogs, for example, can be bred (artificial selection) for aggressiveness or passivity.

These lines of evidence all point to the conclusion that behaviour is not exempt from the sculpting hand of evolution. The first major discipline to form around the study of behaviour from an evolutionary perspective was the field of ethology.

The ethology movement was in part a reaction to the extreme environmentalism in U.S. psychology. Ethologists were interested in four key issues, which have become known as the four "whys" of behaviour advanced by one of the founders of ethology, Nikolaas Tinbergen (1951):

(1) the *immediate influences* on behaviour (e.g., the movement of the mother);

(2) the *developmental influences* on behaviour (e.g., the events during the duck's lifetime that cause changes);

(3) the *function* of behaviour, or the "adaptive purpose" it fulfils (e.g., keeping the baby duck close to the mother, which helps it to survive), and

(4) the *Evolutionary* or *phylogenetic origins* of behaviour (e.g., what sequence of evolutionary events led to the origins of an imprinting mechanism in the duck).

The ethology movement went a long way toward orienting biologists to focus on the importance of adaptation. Ethology also forced psychologists to reconsider the role of biology in the study of human behaviour. This set the stage for an important scientific revolution, brought about by a fundamental reformulation of Darwin's theory of natural selection.

The Inclusive Fitness Revolution:

In the early 1960s, William D. Hamilton was working on his doctoral dissertation at University College, London. Hamilton proposed a new revision of evolutionary theory, which he termed "inclusive fitness theory." Hamilton's theory sparked a revolution that transformed the entire field of biology. Hamilton reasoned that *classical fitness*—the measure of an individual's direct reproductive success in passing on genes through the production of offspring—was too narrow to describe the process of evolution by selection. He theorized that natural selection favours characteristics that cause an organism's genes to be passed on, regardless of whether the organism produces offspring directly.

Parental care—investing in one's own children—was reinterpreted as merely a special case of caring for kin who carry copies of parent's genes in their bodies. An organism can also increase the reproduction of its genes by helping brothers, sisters, nieces, or nephews to survive and reproduce. All these relatives have some probability of carrying copies of the organism's genes. Hamilton's genius was in the recognition that the definition of classical fitness was too narrow and should be broadened to be *inclusive fitness.*

Technically, inclusive fitness is not a property of an individual or an organism but rather a property of its *actions* or *effects.* Thus, inclusive fitness can be viewed as the sum of an individual's own reproductive success (classical fitness) *plus the effects* the individual's actions have on the reproductive success of his or her genetic relatives.

The key point is that the gene is the fundamental unit of inheritance, the unit that is passed on intact in the process of reproduction. Genes producing effects that increase their own replicative success will replace other genes, producing evolution over time. Adaptations are selected and evolve because they promote inclusive fitness.

Thinking about selection from the perspective of the gene offered a wealth of insights unknown in Darwin's day (Buss, 2009). The theory of inclusive fitness has several consequences for how we think about the

psychology of the family, altruism, helping, the formation of groups, and even aggression.

Clarifying Adaptation and Natural Selection:

Williams (1966) challenged the prevailing thinking of *group selection*, the notion that adaptations evolved for the benefit of the group through the differential survival and reproduction of groups (Wynne-Edwards, 1962), as opposed to benefit of the gene and arising through the differential reproduction of genes.

According to the theory of group selection, an animal might limit its personal reproduction to keep the population low, thus avoiding the destruction of the food base on which the population relied. According to group selection theory, only species that possessed characteristics beneficial to their group survived. Those that acted more selfishly perished because of the over-exploitation of the critical food resources on which the species relied.

Williams argued that group selection, although theoretically possible, was likely to be a weak force in evolution, for the following reason. Imagine a bird species with two types of individuals—one that sacrifices itself by committing suicide so as not to deplete its food resources and another that selfishly continues to eat the food, even when supplies are low. In the next generation, which type is likely to have descendants? The answer is that the suicidal birds will have died out and failed to reproduce, whereas those who refused to sacrifice themselves for the group will have survived and left descendants.

Williams's second contribution was in translating Hamilton's theory of inclusive fitness into clear prose that could be comprehended by everyone. To mention one prominent example, inclusive fitness theory partially solved the "problem of altruism": How could altruism evolve—incurring reproductive costs to oneself to benefit the reproduction of others—if evolution favours genes that have the effect of self-replication? Inclusive fitness theory solved this problem (in part) because altruism could evolve if the recipients of help were one's genetic relatives.

Parents, for example, might sacrifice their own lives to save the lives of their children, who carry copies of the parents' genes within them. The same logic applies to making sacrifices for other genetic relatives, such as sisters or cousins. The benefit to one's relatives in fitness currencies must be greater than the costs to the self. If this condition is satisfied, then kin altruism can evolve. In later chapters, we review evidence showing that genetic relatedness is indeed a powerful predictor of helping among humans.

The third contribution of Adaptation and Natural Selection was Williams's careful analysis of adaptation, which he referred to as "an onerous concept." Adaptations may be defined as evolved solutions to specific problems that contribute either directly or indirectly to successful reproduction. Sweat glands, for example, may be adaptations that help

solve the survival problem of thermal regulation. Taste preferences may be adaptations that guide the successful consumption of nutritious food. Mate preferences may be adaptations that guide the successful selection of fertile mates.

The problem is how to determine which attributes of organisms are adaptations. Williams established several standards for invoking adaptation and believed that it should be invoked only when necessary to explain the phenomenon at hand. When a flying fish leaps out of a wave and falls back into the water, for example, we do not have to invoke an adaptation for "getting back to water." This behaviour is explained more simply by the physical law of gravity.

Trivers's Seminal Theories:

In the late 1960s and early 1970s Robert Trivers, studied Williams's 1966 book on adaptation. Trivers contributed three seminal papers, all published in the early 1970s. The **first was the theory of reciprocal altruism among nonkin**—the conditions under which mutually beneficial exchange relationships or transactions could evolve (Trivers, 1971).

The second was parental investment theory, which provided a powerful statement of the conditions under which sexual selection would occur for each sex (1972).

The third was the theory of parent–offspring conflict—the notion that even parents and their progeny will get into predictable sorts of conflicts because they share only 50 percent of their genes (1974). Parents may try to wean children before the children want to be weaned, for example, in order to free up resources to invest in other children. More generally, what might be optimal for a child (e.g., securing a larger share of parental resources) might not be optimal for the parents (e.g., distributing resources more equally across children).

The Socio-biology Controversy:

Eleven years after Hamilton's paper on inclusive fitness was published, a Harvard biologist named Edward O. Wilson wrote a book '*Sociobiology: The New Synthesis'*. It offered a synthesis of cellular biology, integrative neurophysiology, ethology, comparative psychology, population biology, and behavioural ecology. It also examined species from ants to humans, proclaiming that the same fundamental explanatory principles could be applied to all.

Sociobiology is not generally regarded as containing fundamentally new theoretical contributions to evolutionary theory. It actually synthesized all the previous work under one umbrella.

The chapter on humans, the last in Wilson's book created the most controversy. His work sparked attacks from Marxists, radicals, creationists, other scientists, and even members of his own department at Harvard. Part of the controversy stemmed from the nature of Wilson's

claims. He asserted that sociobiology would "cannibalize psychology," which was not greeted warmly by most psychologists. Further, he speculated that many important human phenomena, such as culture, religion, ethics, and even aesthetics, would ultimately be explained by the new synthesis. These assertions strongly contradicted the dominant theories in the social sciences. Culture, learning, socialization, rationality, and consciousness, not evolutionary biology, were presumed by most social scientists to explain human behaviour.

Despite Wilson's claims for a new synthesis that would explain human nature, he had little empirical evidence on humans to support his views. The bulk of the scientific evidence came from nonhuman animals. Most social scientists could not see what ants and fruit flies had to do with people. Furthermore, the tremendous resistance to Wilson's inclusion of humans within the purview of evolutionary theory was based on several common misunderstandings. We will highlight some of the misunderstandings here.

1.4 COMMON MISUNDERSTANDINGS ABOUT EVOLUTIONARY THEORY

The theory of evolution by selection generates a number of common misunderstandings (Confer et al., 2010).

Misunderstanding 1: Human Behaviour Is Genetically Determined

Genetic determinism is the doctrine that argues that behaviour is controlled exclusively by genes, with little or no role for environmental influence. Much of the resistance to applying evolutionary theory to the understanding of human behaviour stems from the misconception that evolutionary theory implies genetic determinism. Contrary to this misunderstanding, evolutionary theory represents a truly interactionist framework.

Human behaviour cannot occur without two ingredients: (1) evolved adaptations and (2) environmental input that triggers the development and activation of these adaptations.

Notions of genetic determinism—behaviours caused by genes without input or influence from the environment—are simply false. They are in no way implied by the evolutionary theory or by evolutionary psychology.

Misunderstanding 2: If It's Evolutionary, We Cannot Change It:

A second misunderstanding is that evolutionary theory implies that human behaviour is impervious to change. Consider the simple example of calluses again. Humans can and do create physical environments that are relatively free of friction. These friction-free environments mean that we have designed change—a change that prevents the activation of the underlying callus-producing mechanisms. Knowledge of these mechanisms and the environmental input that triggers their activation give

us the power to decrease callus production. Knowledge of this mechanism, however, allows for the possibility of change.

More knowledge about our evolved psychology, however, gives us more power to change.

Misunderstanding 3: Current Mechanisms Are Optimally Designed:

The concept of adaptation, the notion that mechanisms have evolved functions, has led to many outstanding discoveries over the past century (Dawkins, 1982). This does not mean, however, that the current collection of adaptive mechanisms that make up humans is in any way "optimally designed."

One constraint on optimal design is *evolutionary time lags.* Evolution refers to change over time. Each change in the environment brings new selection pressures. Because evolutionary change occurs slowly, requiring hundreds or thousands of generations of recurrent selection pressure, existing humans are necessarily designed for the previous environments of which they are a product. Stated differently, we carry around a Stone Age brain in a modern environment. In other words, "we are walking archives of ancestral wisdom" (Cronin, 1991). A strong taste preference for fat and sugar, adaptive in a past environment of scarce food resources, now leads to clogged arteries, Type 2 diabetes, and heart attacks. The lag in time between the environment that fashioned Our mechanisms (the hunter-gatherer past that formed much of our selective environment) and today's environment means that our some of our existing evolved mechanisms may not be optimally designed for the current environment.

All adaptations carry costs. Selection favours a mechanism when its benefits outweigh the costs relative to other designs existent at the time. Humans have evolved mechanisms that are reasonably good at solving adaptive problems efficiently, but they are not designed as optimally as they might be if costs were not a constraint. Evolutionary time lags and the costs of adaptations are just two of the many reasons why adaptations are not optimally designed (Williams, 1992).

In summary, part of the resistance to the application of evolutionary theory to humans are based on several common misconceptions. Contrary to these misconceptions, evolutionary theory does not imply genetic determinism. It does not imply that we are powerless to change things. It does not mean that our existing adaptations are optimally designed. With these common misunderstandings about evolutionary theory clarified, let's turn to an examination of the milestones in human evolutionary history.

1.5 ORIGINS OF HUMAN NATURE, EVOLUTIONARY GAME THEORY

Three Theories of the Origins of Complex Adaptive Mechanism:

In the past century, three major theories have been proposed to account for the origins of adaptations.

Creationism Theory:

One theory is creationism, or "intelligent design," the idea that a supreme deity created all of the plants and animals, from the largest whales to the smallest plankton in the ocean, from the simple single celled amoebas to the complex human brain. Creationism is not viewed as a "scientific theory" for three reasons.

- **First,** it cannot be tested because specific empirical predictions do not follow from its major premise. Whatever exists does so simply because the Supreme Being has created it.
- **Second**, creationism has not guided researchers to any new scientific discoveries.
- **Third**, creationism has not proved useful as a scientific explanation for already discovered organic mechanisms. Creationism, therefore, is a matter of religion and belief, not a matter of science. It cannot be proved to be false, but it has not proven useful as a predictive or an explanatory theory (Kennair, 2003).

Seeding Theory:

A second theory is seeding theory. According to seeding theorists, life did not originate on earth. In one version of this theory, the seeds of life arrived on earth via a meteorite.

In a second version of seeding theory, extraterrestrial intelligent beings came down from other planets or galaxies and planted the seeds of life on earth. Regardless of the origins of the seeds, however, evolution by natural selection presumably took over, and the seeds eventually evolved into humans and the other life forms observed today.

Seeding theory is in principle testable. We can study meteorites for signs of life, which would lend plausibility to the theory that life originated elsewhere. We can scour the earth for signs of extraterrestrial landings. We can look for evidence of life forms that could not have originated on earth. Seeding theory, however, runs into two problems.

- **First**, there is currently no solid scientific evidence on earth that such "seedings" have taken place.
- **Second,** seeding theory has not led to any new scientific discoveries, nor has it explained any existing scientific puzzles. Most important, however, seeding theory simply pushes the causal explanation for life forms back in time. If the earth was really seeded by extraterrestrial beings, what causal processes led to the origins of these intelligent beings?

Evolution by Natural Selection:

The third theory is evolution by natural selection. Although evolution by natural selection is called a theory, its fundamental principles have been

confirmed so many times—and never disconfirmed—that it is viewed by most biologists as a fact (Alcock, 2013). The components of its operation—differential reproduction due to inherited design differences—have been shown to work in both the laboratory and the wild. The differing sizes of the beaks of finches on different islands in the Galápagos, for example, have evolved to correspond to the size of the seeds prevalent on each island (Grant, 1991). Larger beaks are needed when the seeds are large; smaller beaks are better when the seeds are tiny. The theory of natural selection has many virtues that scientists seek in a scientific theory: (1) it explains known facts; (2) it leads to new predictions; and (3) it provides guidance to important domains of scientific inquiry.

So among the three theories—creationism, seeding theory, and natural selection— there is no real contest. Evolution by natural selection is the only known scientific theory that can explain the astonishing diversity of life we see around us today. And it is the only known scientific theory that has the power to account for the origins and structure of complex adaptive mechanisms—from callus-producing mechanisms to large brains— that define human nature.

1.6 THE THREE PRODUCTS OF EVOLUTION

There are three products of the evolutionary process—adaptations, by-products (or concomitants) of adaptation, and random effects (or noise).

Product	Brief Definition
Adaptation s	Inherited and reliably developing characteristics that came into existence through natural selection because they helped to solve problems of survival or reproduction better than alternative designs existing in the population during the period of their evolution; example: umbilical cord
By-products	Characteristics that do not solve adaptive problems and do not have functional design; they are "carried along" with characteristics that do have functional design because they happen to be coupled with those adaptations; example: belly button
Noise	Random effects produced by forces such as chance mutations, sudden and unprecedented changes in the environment, or chance effects during development; example: particular shape of a person's belly button

Table 1.1 Three Products of the Evolutionary Process

Source: Evolutionary Psychology: The New Science of the Mind by David Buss, 5th Ed.

An adaptation may be defined as an inherited and reliably developing characteristic that came into existence through natural selection because it helped to solve a problem of survival or reproduction during the period of its evolution (Tooby & Cosmides, 1992).

An adaptation must have genes "for" that adaptation. Those genes are required for the passage of the adaptation from parents to children; hence, adaptations have a genetic basis.

An adaptation must develop reliably among species members in all "normal" environments.

Adaptations are fashioned by the process of selection. Selection acts as a sieve in each generation, filtering out the many features that do not contribute to propagation and letting through those that do (Dawkins, 1996). This sieving process recurs generation after generation so that each new generation is a bit different from its parent generation. Those characteristics that make it through the filtering process in each generation do so because they contribute to the solution of an adaptive problem of either survival or reproduction better than alternative (competing) designs existing in the population.

The function of an adaptation refers to the adaptive problem it evolved to solve, that is, precisely how it contributes to survival or reproduction. The function of an adaptation is typically identified and confirmed by the evidence of "special design," whereby the components or "design features" all contribute in a precise manner to solve a particular adaptive problem.

Each adaptation has its own period of evolution. Initially, a mutation, a copying error in a piece of DNA, occurs in a single individual. Although most mutations hinder survival or reproduction, some, by chance alone, end up helping the organism survive and reproduce.

If the mutation is helpful enough to give the organism a reproductive advantage over other members of the population, it will be passed down to the next generation in greater numbers. In the next generation, therefore, more individuals possess the characteristic that was initially a mutation in a single person. Over many generations, if it continues to be successful, the mutation will spread to the entire population, so every member of the species will have it.

Although adaptations are the primary products of evolution, the evolutionary process also produces by-products of adaptations. By-products are characteristics that do not solve adaptive problems and do not have a functional design. They are "carried along" with characteristics that do have functional design because they happen to be coupled with those adaptations, just as the heat from a lightbulb is a by-product of design for light.

Consider the human belly button. There is no evidence that the belly button, per se, helps humans survive or reproduce. A belly button is not good for catching food, detecting predators, avoiding snakes, finding good habitats, or choosing mates. It does not seem to be directly or indirectly involved in the solution to an adaptive problem. Rather, the belly button is a by-product of something that is an adaptation—namely, the umbilical cord that provided food to the growing foetus. The hypothesis that something is a by-product of an adaptation, therefore, requires identifying the adaptation of which it is a by-product and the reason why its existence is associated with that adaptation.

Belly buttons are not adaptations—they are not good for catching prey or deterring predators. Rather, they are by-products of something that was an adaptation—the formerly functional umbilical cord by which a foetus obtained nutrients from its mother.

The **third and final product of the evolutionary process** is noise or random effects. Random effects can be produced by forces such as mutations, sudden and unprecedented changes in the environment, or accidents during development. These random effects sometimes harm the smooth functioning of an organism, much as throwing sand into a machine or spilling scalding coffee onto the hard drive of your computer may ruin its functional operation. Some random effects are neutral—they neither contribute to nor detract from adaptive functioning—and some are beneficial to an organism. Noise is distinguished from by-products in that it is not linked to the adaptive aspects of design features but rather is independent of such features.

In summary, the evolutionary process produces three products—adaptations, by-products of adaptations, and random effects. Evolutionary scientists differ in their estimates of the relative sizes of these three categories of products. Some believe that even uniquely human qualities, such as language, are merely incidental by-products of our large brains (Gould, 1991). Others see overwhelming evidence that human language is an adaptation (Pinker, 1994).

1.7 LEVELS OF EVOLUTIONARY ANALYSIS IN EVOLUTIONARY PSYCHOLOGY

One of the essential features of any science is the formulation of hypotheses. In the case of evolutionary psychology, the nature of hypotheses typically centres on adaptive problems and their solutions. More specifically, it centres on the adaptive problems faced by our ancestors and on the adaptive psychological solutions to those problems.

General Evolutionary Theory:

The first level of analysis is general evolutionary theory. In its modern form, evolution by natural selection is understood from the "gene's eye" perspective—differential gene replication is the engine of the evolutionary

process by which adaptations are formed (Cronin, 2005; Dawkins, 1982, 1989; Hamilton, 1964; Williams, 1966).

Natural selection, however, is the only known fundamental causal process capable of creating complex functional design and hence will be treated here as the most general level in the hierarchy of evolutionary theorizing.

At this general level, even though we talk about evolutionary "theory," it is widely accepted by biological scientists as fact. Most of the research in evolutionary psychology proceeds from the assumption that evolutionary theory is correct, but the research does not test that assumption directly.

There are observations that could, in principle, falsify general evolutionary theory: if scientists observed complex life forms that were created in time periods too short for natural selection to have operated (e.g., in seven days); if scientists discovered adaptations that functioned solely for the benefit of other species; if scientists discovered adaptations that functioned for the benefit of same-sex competitors; and so on (Darwin, 1859; Mayr, 1982; Williams, 1966). No such phenomena have ever been documented.

Middle-Level Evolutionary Theories:

Moving one level down we find middle-level theories such as Trivers's theory of parental investment and sexual selection. Let's examine one theory —Trivers's theory of parental investment as the driving force behind sexual selection. This theory, an elaboration of Darwin's theory of sexual selection (1871), provided one of the key ingredients for predicting the operation of mate choice and intra-sexual competition (competition between members of the same sex). Trivers argued that the sex that invests more resources in its offspring (often, but not always, the female) will evolve to be more choosy or discriminating in selecting a mate. The sex that invests fewer resources in its offspring, in contrast, will evolve to be less choosy and more competitive with members of their own sex for sexual access to the valuable, high-investing opposite sex.

Middle-level theories must be compatible with general evolutionary theory, but they must stand or fall on their own merits.

Specific Evolutionary Hypotheses:

Let's now examine the specific evolutionary hypotheses. One hypothesis that has been advanced for humans, for example, is that women have evolved specific preferences for men who have resources to offer (Buss, 1989; Symons, 1979). The logic is as follows. First, because women invest heavily in children, they have evolved to be choosy when they pick mates—the standard prediction from parental investment theory. Second, the content of women's choices should reflect whatever has historically increased the survival and reproduction of them and their children.

Therefore, women are hypothesized to have evolved mate preferences for men who are both able and willing to contribute resources to them and

their children. This is an evolutionary psychological hypothesis because it proposes the existence of a specific psychological mechanism—a desire—that is designed to solve a specific human adaptive problem, namely securing a mate who appears capable of investing in children.

This specific evolutionary psychological hypothesis can be tested empirically. Scientists can study women across a wide variety of cultures and determine whether they in fact prefer men who are able and willing to contribute resources to them and their children.

On the basis of the hypothesis that women prefer men who have resources to offer, we could make the following predictions: (1) Women will value in men specific qualities known to be linked with the acquisition of resources such as social status, intelligence, and somewhat older age; (2) in a singles bar, women's attention, as measured by eye gaze, will be drawn more to men who appear to have resources than to men who do not; and (3) women whose husbands fail to provide economic resources will be more likely to divorce them than women whose husbands do contribute economic resources.

All of these predictions follow from the hypothesis that women have a specific evolved preference for men with resources. The value of the hypothesis rests with the scientific tests of predictions derived from it. If the predictions fail—if women are shown not to desire personality characteristics known to be linked with resource acquisition, do not gaze more at men with resources in singles bars, and are not more likely to divorce husbands who fail to provide resources—then the hypothesis will not be supported. If the predictions succeed, then the hypothesis is supported.

Evaluation of evolutionary formulations rests with the cumulative weight of the evidence, and not necessarily with any single prediction. Evolutionary hypotheses, when formulated precisely, are highly testable and capable of being falsified when the evidence fails to support predictions derived from them (Ketelaar & Ellis, 2000).

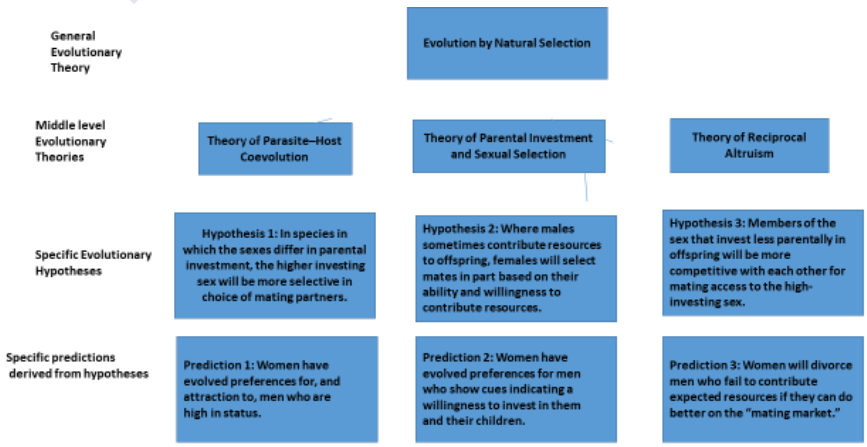

Table 1.2: Three levels of Evolutionary Hypotheses

Source: Evolutionary Psychology: The New Science of the Mind by David Buss, 5th Ed.

1.8 TWO STRATEGIES FOR GENERATING AND TESTING EVOLUTIONARY HYPOTHESES

There are two strategies for generating and testing evolutionary hypotheses. One strategy is called the top-down or theory driven approach to hypothesis generation. One can start at the top with general evolutionary theory and derive hypotheses. For example, we could predict solely based on inclusive fitness theory that humans will help close genetic relatives more than they will distant genetic relatives. Or we could generate a hypothesis based on Trivers's middle-level theory of parental investment. Either way, the derivations flow downward going from the general to the specific.

Top-down strategy:

The **top-down strategy** illustrates one way in which theories can be extraordinarily useful. Theories provide a set of working premises from which specific hypotheses can be generated. They also furnish a framework for guiding researchers to important domains of inquiry such as investing in kin or children.

Bottom- up strategy:

There is a second strategy for generating evolutionary psychological hypotheses called as bottom-up strategy. Instead of starting with a theory, we can start with an observation. Once the observation is made about the existence of a phenomenon, we can then proceed in a **bottom-up** fashion and generate a hypothesis about its function. Because humans are keen perceivers of other people, they generally notice things even without a formal theory to direct attention to them. For example, most people don't need a theory to tell them that humans communicate through spoken language, walk upright on two legs, and sometimes wage war on other groups. There is nothing in general evolutionary theory that would have generated the hypothesis that language, bipedal locomotion, or group-on-

Strategy 1: Theory-Driven or "Top – down" Strategy		Strategy 2: Observation-Driven or "Bottom-Up" Strategy
Step 1: Derive Hypothesis from Existing Theory Example: From parental investment theory, we can derive the hypothesis that because women have a greater obligatory investment in offspring than men, women will tend to be more choosy or discriminating in their selection of a mate.		*Step 1: Develop Hypothesis about Adaptive Function Based on a Known Observation:* Example: A. Observation: Men seem to give higher priority than women to physical appearance in the selection of a mate. B. Hypothesis: Women's physical appearance provided ancestral men with cues to fertility.
Step 2: Test Predictions Based on Hypothesis		*Step 2: Test Predictions Based on Hypothesis*

Example: Conduct an experiment to test the prediction that a woman will impose a longer delay and more stringent standards before consenting to sex to evaluate a man's quality and commitment.		Example: Conduct experiments to determine whether men's standards of attractiveness are closely based on cues to a woman's fertility.
Step 2: Test Predictions Based on Hypothesis Example: Conduct an experiment to test the prediction that a woman will impose a longer delay and more stringent standards before consenting to sex to		*Step 2: Test Predictions Based on Hypothesis* Example: Conduct experiments to determine whether men's standards of attractiveness are closely based on cues to a woman's fertility.
Step 3: Evaluate Whether Empirical Results Confirm Predictions Example: Women impose longer delays and impose more stringent standards than men before consenting to sex (Buss & Schmitt, 1993; Kennair, Schmitt, Fjeldavli, & Harlem, 2009).		*Step 3: Evaluate Whether Empirical Results Confirm Predictions* Example: Men find a low waist-to-hip ratio, a known fertility correlate, attractive (Dixon, Grimshaw, Linklater, & Dixon, 2010; Singh, 1993).

Table 1.3 Two Strategies of Generating and Testing Evolutionary Hypotheses

Source: Evolutionary Psychology: The New Science of the Mind by David Buss, 5th Ed.

1.9 EVOLUTIONARY GAME THEORY

Evolutionary game theory (EGT) is the application of game theory to evolving populations in biology. It defines a framework of contests, strategies, and analytics into which Darwinian competition can be modelled. It originated in 1973 with John Maynard Smith and George R. Price's formalisation of contests, analysed as strategies, and the mathematical criteria that can be used to predict the results of competing strategies.

Evolutionary game theory has helped to explain the basis of altruistic behaviours in Darwinian evolution. It has in turn become of interest to economists, sociologists, anthropologists, and philosophers.

Evolutionary game theory started with the problem of how to explain ritualized animal behaviour in a conflict situation; "why are animals so 'gentlemanly or ladylike' in contests for resources?" The ethologists Niko Tinbergen and Konrad Lorenz proposed that such behaviour exists for the benefit of the species. John Maynard Smith considered that incompatible with Darwinian thought, where selection occurs at an individual level, so self-interest is rewarded while seeking the common good is not. Maynard Smith, a mathematical biologist, turned to game theory as suggested by George Price.

Adapting game theory to evolutionary games:

Maynard Smith realised that an evolutionary version of game theory does not require players to act rationally —– only that they have a strategy. The results of a game shows how good that strategy was, just as evolution tests alternative strategies for the ability to survive and reproduce. In biology, strategies are genetically inherited traits that control an individual's action, analogous with computer programs. The success of a strategy is determined by how good the strategy is in the presence of competing strategies (including itself), and of the frequency with which those strategies are used. Maynard Smith described his work in his book Evolution and the Theory of Games.

Prisoner's dilemma and reciprocal altruism:

There is a branch of mathematics that deals with the decisions that people are predicted to make depending on the strategies of others. It's called game theory.

The whole idea about game theory is that it examines problems the world presents in both simplified and universal ways. One of the main aims of game theory is to find a solution to a problem which, given what everybody else is doing, cannot be bettered. This accepted solution is known as the Nash equilibrium after the Nobel-prize-winning Princeton mathematician John Nash, about whom the film A Beautiful Mind was made.

Having been developed by economists to predict what people are likely to do with investment decisions, John Maynard-Smith introduced game theory into animal behaviour to explain the relationship between behaviour and evolution.

Subsequently it has been developed to help understand the evolutionary basis of human decision making. But what, you might ask, has this got to do with reciprocal altruism? One particular hypothetical scenario that game theory has been applied to solving is called 'prisoner's dilemma'. As you'll see, it may be likened to the problems surrounding reciprocal altruism.

In prisoner's dilemma two criminal suspects are arrested by the police and placed in separate questioning cells. Each is told that if they implicate the other, they will be rewarded and set free while the other will receive a harsh sentence. If, however, neither talks then both will receive a light sentence.

In game theory terminology implicating the other is called **'defection'** and refusing to talk is called **'cooperation'**. The outcome or payoff for each player is generally symbolised by one of four symbols:

T is the temptation to defect;

R is the reward each receives if they cooperate;

P is the punishment they receive if both defect; and

S is the sucker's payoff – that is, if you cooperate when your partner has defected.

In this set-up it is important that the payoff decreases from T through R and P to S. It is also necessary that the payoff for mutual cooperation is greater than the average payoff for cooperation and defection – otherwise there is no real incentive to cooperate.

Mathematically we can express the payoff in prisoner's dilemma as

$T > R > P > S$.

In practice the game is played for points – providing values for each of these will help. Typically, the following values are given:

$T = 5; R = 3; P = 1; S = 0$

We can represent the four possible outcomes in a 'payoff matrix' below. Note that the points gained are given for Player B in the above example, not Player A (although in the case of mutual defection or cooperation both players will have equal scores).

	Cooperate	Defect
Player B		
Cooperate	R= 3	S= 0
	Reward for	Sucker's payoff
	Mutual cooperation	
Defect	T= 5	P= 1
	Temptation to	Punishment for
	Defect	mutual defection

Table 1.4: The prisoner's dilemma – 'payoff matrix' showing four possible outcomes

Source: Wikipedia

Now here's the dilemma. Both players should realise that rationally they should defect – but this makes each worse off than if they both cooperated. But why can we expect that each would defect? Think the following:

If you are playing this game, you must consider what your partner might do. If your partner cooperates, then by defecting you will gain 5 points; if your partner defects then you will have to defect in order to gain the 1 point for punishment rather than the 0 which is a sucker's payoff.

The dilemma boils down to the fact that you do not know what your partner is going to do. **Prisoner's dilemma suggests that people should not cooperate**.

At this point you might be thinking that prisoner's dilemma sounds like a little game which has nothing to do with real social behaviour. However, as Matt Ridley puts it, prisoner's dilemmas are all around us: Broadly speaking any situation in which you are tempted to do something but knew it would be a great mistake if everybody did the same thing, is likely to be a prisoner's dilemma. (Ridley, 1996)

Thus, deciding whether or not to buy a round of drinks, deciding whether or not to repay the favour of babysitting, considering the tipping of a waiter, and perhaps most importantly of all, deciding whether or not to remain faithful in a relationship – these may all be thought of as the equivalent of prisoner's dilemmas. Put crudely, the dilemma that players face lies in deciding whether to reciprocate (cooperate – in a sense the equivalent of reciprocal altruism) or to cheat (defect).

If as Ridley claims, prisoner's dilemmas are all around us and if the only logical act is to defect/cheat then how can we explain the regular reciprocal altruism that we encounter in human societies (and in at least some social animals)?

Many researchers claim that we should not expect to see cooperation under such circumstances. And yet – all around us people do cooperate. The mathematicians who initially explored prisoner's dilemma in the 1960s also found that people often cooperated on the game even though this seemed illogical.

They concluded that people just don't act rationally – that they weren't sophisticated enough to realise that double defection is the only logical response (Rapoport and Chummah, 1965). But if prisoner's dilemma is a model of the sort of decisions, we face all of the time, then surely, we should have evolved to play the game rationally? The answer came when animal behaviourists pointed out that real-life social relations are rarely like a one-off game of prisoner's dilemma but that social animals encounter each other repeatedly and remember what happened on the last encounter. So social life is more akin to a series of such games where the same players meet each other frequently.

Whereas in 'one-shot' prisoner's dilemma, defection is the only logical option, when the game is played repeatedly by the same two players they will frequently fall into a pattern of mutual cooperation. In this way, both continually gain three points.

But why exactly is tit-for-tat so successful against all other strategies? Political scientist Robert Axelrod, who has frequently examined prisoner's dilemma, considers TFT to be an evolutionarily stable strategy (or ESS). An ESS is a strategy that cannot be bettered provided sufficient members of a group adopt it (Maynard-Smith, 1974).

Today many social scientists consider that tit-for-tat describes well a common strategy that people employ when deciding how to respond to others. In addition to helping to describe and explain general incidents of social responses, it has even been used to help explain behaviour during

warfare – both for the escalation of violence (Chagnon, 1983) and in some cases its dissipation (Axelrod, 1984).

1.10 SUMMARY

Evolutionary biology has undergone many historical developments. Evolution was suspected to occur long before Charles Darwin proposed his theory of natural selection. Missing before him, however, was a theory about a causal process that could explain how changes in life forms could occur. The theory of natural selection was Darwin's first contribution to evolutionary biology. Natural selection occurs when some inherited variations lead to greater reproductive success than other inherited variations.

In short, natural selection is defined as changes over time due to the differential reproductive success of inherited variants. Natural selection theory provides a causal process by which change, the modification of organic structures, takes place over time. Second, it proposed a theory to account for the origin of new species. Third, it united all living forms into one grand tree of descent and simultaneously revealed the place of humans in the grand scheme of life.

The fact that it has now survived more than a century and a half of scientific scrutiny, despite many attempts to find flaws in it, must surely qualify it as a great scientific theory (Alexander, 1979; Dennett, 1995).

Darwin devised a second evolutionary theory: the theory of sexual selection. Sexual selection deals with the evolution of characteristics due to success in mating rather than to success in survival. Sexual selection operates through two processes: intrasexual competition and intersexual selection.

A major problem with Darwin's theory was that it lacked a workable theory of inheritance. This theory was provided when the work of Gregor Mendel was recognized and synthesized with Darwin's theory of natural selection in a movement called the Modern Synthesis. According to this theory, inheritance does not involve blending of the two parents but rather is particulate. Genes, the fundamental unit of inheritance, come in discrete packets that are not blended but rather are passed on intact from parent to child. The particulate theory of inheritance provided the missing ingredient to Darwin's theory of natural selection.

In 1964, the theory of natural selection was reformulated in a revolutionary pair of articles published by W. D. Hamilton. The process by which selection operates, according to Hamilton, involves not just classical fitness (the direct production of offspring), but also inclusive fitness, which includes the effects of an individual's actions on the reproductive success of genetic relatives, weighted by the appropriate degree of genetic relatedness. The inclusive fitness reformulation provided a more precise theory of the process of natural selection by promoting a "gene's eye" view of selection.

In 1966, George Williams published the now-classic Adaptation and Natural Selection, which had three effects. First, it led to the downfall of group selection. Second, it promoted the inclusive fitness revolution and helped to marshal in differential gene reproduction that is the central causal process of evolution by selection. And third, it provided rigorous criteria for identifying adaptations, such as efficiency, reliability, and precision.

In the 1970s, Robert Trivers built on the work of Hamilton and Williams, offering three seminal theories that remain important today: reciprocal altruism, parental investment, and parent–offspring conflict.

In 1975, Edward O. Wilson published Sociobiology: A New Synthesis, which attempted to synthesize the key developments in evolutionary biology. Wilson's book created controversy, mostly because of its final chapter, which focused on humans, offering a series of hypotheses but little empirical data.

As far as levels of evolutionary hypotheses are concerned, there are three evolutionary levels: general level theories, middle-level evolutionary theories and specific evolutionary hypotheses about empirical phenomena derived from these hypotheses.

One method of hypothesis generation is to start at the higher levels and move down. A middle-level theory can produce several hypotheses, each of which in turn yields several testable predictions. This can be described as the "top-down" strategy of hypothesis and prediction formation.

A second method is to start with a phenomenon known or observed to exist. From this phenomenon, one can generate hypotheses about the possible function for which it was designed. This is called as bottom-up method.

The evolutionary process produces three products: adaptations, by-products of adaptations, and random effects or noise.

Evolutionary game theory (EGT) is the application of game theory to evolving populations in biology. It defines a framework of contests, strategies, and analytics into which Darwinian competition can be modelled. It originated in 1973 with John Maynard Smith and George R. Price's formalisation of contests, analysed as strategies, and the mathematical criteria that can be used to predict the results of competing strategies.

Evolutionary game theory has helped to explain the basis of altruistic behaviours in Darwinian evolution. It has in turn become of interest to economists, sociologists, anthropologists, and philosophers.

1.11 QUESTIONS

Q. 1 Discuss landmarks in the history of evolutionary thinking.

Q. 2 Describe Darwin's theory of natural and sexual selection.

Q. 3 Write in detail on evolutionary game theory

Q. 4 Write Short Notes

a) The Ethology Movement

b) Trivers's Seminal Theories

c) Specific Evolutionary Hypotheses

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2

FOUNDATION OF EVOLUTIONARY PSYCHOLOGY – II

Unit Structure

2.0 OBJECTIVES

- After learning this chapter, you will understand various evolved psychological mechanisms and their properties.
- You will gather knowledge regarding the influence of culture on evolved psychological mechanisms.
- You will also learn about methods of testing evolutionary hypotheses and various sources from which data can be gathered in order to test the evolutionary hypotheses.

In this section, the core of human nature from an evolutionary psychological perspective will be addressed. First, all species, including humans, have a nature that can be described and explained. Second, a definition of evolved psychological mechanisms— the core units that comprise human nature, will be provided. Finally, important properties of evolved psychological mechanisms will be examined.

2.1 INTRODUCTION

All Species Have a Nature:

It is part of the male lion's nature to walk on four legs, grow a large furry mane, and hunt other animals for food. It is part of the butterfly's nature to enter a flightless pupa state, wrap itself in a cocoon, and emerge to soar, fluttering gracefully in search of food and mates. It is part of the porcupine's nature to defend itself with quills, the skunk's to defend itself with a spray, the stag's to defend itself with antlers, and the turtle's to defend itself with a shell. All species have a nature; that nature is different

for each species. Each species has faced somewhat unique selection pressures during its evolutionary history and therefore has confronted a somewhat unique set of adaptive problems.

In the same way, humans also have a nature—qualities that define us as a unique species—and all psychological theories imply its existence. For Sigmund Freud, human nature consisted of sexual and aggressive impulses whereas, for William James, human nature was all about instincts. Even the most ardent environmentalist theories, such as B. F. Skinner's theory of behaviorism, maintained that humans have a nature—in this case, consisting of a few general learning mechanisms. All psychological theories require at their core fundamental premises about human nature.

Because evolution by selection is the only known causal process capable of producing the fundamental components of that human nature, all psychological theories are evolutionary. If humans have a nature and evolution by selection is the causal process that produced that nature, then the obvious next question is: What insights into human nature can be obtained by examining our evolutionary origins? Can examining the process of evolution tells us anything about the products of that process in the human case? Answers to these key questions form the core of the rest of this book. Whereas the broader field of evolutionary biology is concerned with the evolutionary analysis of all the parts of an organism, evolutionary psychology focuses more narrowly on those parts that are psychological—the analysis of the human mind as a collection of evolved information-processing mechanisms and the behaviors generated by those mechanisms. And so, we turn now to the class of adaptations that make up the human mind: evolved psychological mechanisms.

2.2 DEFINITION OF AN EVOLVED PSYCHOLOGICAL MECHANISM

An evolved psychological mechanism is a set of processes inside an organism with the following properties:

1. An evolved psychological mechanism exists because it solved a specific problem:

An evolved psychological mechanism solved a specific problem of survival or reproduction over evolutionary history that is why it exits in the present form. This means that the design features of a psychological mechanism must be coordinated with the features required to solve an adaptive problem of survival or reproduction.

2. An evolved psychological mechanism is designed to take in only a narrow slice of information:

Only a narrow slice of information from the environment is taken by evolved psychological mechanisms. Consider the human eye. It looks as though we open our eyes and see nearly everything, the eye is actually sensitive only to a narrow range of input from the broad spectrum of electromagnetic waves—those within the visual spectrum. For example,

we cannot see X-rays. We cannot even see radio waves. The eye is not an all-purpose seeing device. It is made in a way to process only narrow information —from among the much larger domain of potential information.

In the same way, the psychological mechanism of a predisposition to learn to fear snakes is meant to take in only very little information—slithery movements from self-propelled elongated objects. Our evolved preferences for food, landscapes, and mates are all designed to take in only a limited subset of information from among the infinite array that could potentially constitute input.

3. Input of an evolved psychological mechanism tells an organism the particular adaptive problem it is facing:

The input of seeing a moving snake tells you that you are facing a particular survival problem, namely, physical damage and perhaps death if bitten. The different smells of edible objects—rotting versus sweet and fragrant—tell you that you are facing an adaptive survival problem of food selection. It can be said that the input lets the organism know which adaptive problem it is dealing with. This occurs outside consciousness. For example, we do not smell a cake baking and think, "Oh! I am facing an adaptive problem of food selection!" Instead, the smell unconsciously triggers food selection mechanisms and no awareness of the adaptive problem is necessary.

4. The input of an evolved psychological mechanism is transformed through decision rules into output:

Let us continue with our earlier example of snake. After seeing a snake, you have three options: you can decide to attack it, run away from it, or freeze. Upon smelling a cake just out of the oven, you can choose to eat it or walk away from it. The decision rules are sets of procedures— "if, then" statements—for guiding an organism down one path or another. For example, while publicly arguing with an angry person, humans might have "if, then" decision rules such as: "If the angry rival is larger and stronger, then avoid a physical fight; if the angry person is smaller and weaker, then accept the public challenge and fight." In this example, inputs (a confrontation by an angry person of a particular size) are transformed through decision rules ("if, then" procedures) into output (behavior to either fight or flee) (Figure 2.1).

Evolved Psychological Mechanisms:

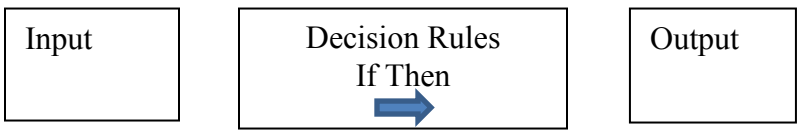

Figure 2.1: A modern formulation of evolved psychological mechanisms as information-processing adaptations

Source: Evolutionary Psychology: The New Science of the Mind by David Buss, 5th Ed.

5. The output of an evolved psychological mechanism can be a physiological activity, information to other psychological mechanisms, or manifest behavior:

You may get physiologically aroused or frightened (physiological output) on seeing a snake; you may use this information to evaluate your behavioral options such as freezing or fleeing (information to other psychological mechanisms); or you can use this evaluation for action, such as running away (behavioral output).

Consider another example: sexual jealousy. Let's say you go to a party with your wife and then leave the room to get a drink. When you return, you find your wife is smiling and talking with another person. You also notice they are holding each other's hands. These cues might trigger the feeling of jealousy in you. The cues act as input to the mechanism, signalling to you an adaptive problem—the threat of losing your partner/wife. This input is then evaluated according to a set of decision rules. One option is to ignore the two of them and feign indifference. Another option is to threaten the rival. A third option is to become enraged and hit the rival. Still another option would be to re-evaluate your relationship. Thus, the output of a psychological mechanism can be physiological (arousal), behavioral (confronting, threatening, hitting), or input into other psychological mechanisms (re-evaluating the status of your relationship).

6. The output of an evolved psychological mechanism is directed toward the solution to a specific adaptive problem:

In our previous example, just as the cues to a partner/wife's potential infidelity signal the presence of an adaptive problem, the output of the sexual jealousy mechanism is meant toward solving that problem. Here you have a few options: you may leave the scene, your partner/wife may be persuaded to keep away from flirting with others, or you may re-evaluate your relationship with your wife. These options might help with the solution to your adaptive problem. Saying that the output of a psychological mechanism leads to solutions to specific adaptive problems does not mean that the solutions will always be successful. The output of a psychological mechanism always does not lead to a successful solution, but rather that the output of the mechanism on average tends to solve the adaptive problem better than competing strategies in the environments in which it evolved.

It can be said that a mechanism that led to a successful solution in the evolutionary past may or may not lead to a successful solution now. For example, our taste preferences for fat and sugar were adaptive in our evolutionary past because fat from meat and sugar from ripe fruits were valuable and provided sources of calories. Today, we have sugar-laden soft drinks available on every street corner, fat and sugar are no longer scarce resources. Thus, our strong taste for such substances now cause us

to overconsume fat and sugar, which can lead to clogged arteries and heart attacks and thereby hinder our survival. The point is that evolved mechanisms exist in the forms that they do because they led to success on average during the period in which they evolved. Whether they are currently adaptive- that is whether they currently lead to increased survival and reproduction—is an empirical matter that must be determined on a case-by-case basis.

In summary, an evolved psychological mechanism is a set of procedures within the organism designed to take in a particular slice of information and transform that information via decision rules into output that historically has helped with the solution to an adaptive problem. Psychological mechanisms exist in current organisms because they led, on average, to successful solutions to specific adaptive problems for that organism's ancestors.

2.3 PROPERTIES OF EVOLVED PSYCHOLOGICAL MECHANISMS

This section will examine several important properties of evolved psychological mechanisms.

They provide non-arbitrary criteria for "carving the mind at its natural joints" and tend to be problem-specific, numerous, and complex. These features combine to yield the tremendous flexibility of behavior that characterizes modern humans.

Evolved Psychological Mechanisms Provide Non-arbitrary criteria for "Carving the Mind at Its Joints":

Evolutionary psychology maintains that there is primary non-arbitrary way to identify, describe, and understand psychological mechanisms. This way is to articulate their functions— the specific adaptive problems they were designed by selection to solve.

Let us consider the human body. In principle, the mechanisms of the body could be described in a number of ways. Why do researchers identify as separate mechanisms the liver, the heart, the hand, the nose, and the eyes? The answer is simple. It is based on function. The liver is recognized as a mechanism that performs functions different from those performed by the heart or the hand. The eyes and the nose, although located close together, perform different functions and operate according to different inputs (electromagnetic waves in the visual spectrum versus odors). If an anatomist tried to lump the eyes and the nose into one category, it would seem ludicrous. Understanding the component parts of the body requires the identification of function. Function provides a non-arbitrary way to understand these component parts.

Evolutionary psychologists believe that the same principles should be used for understanding the mechanisms of the mind. Although the mind could be divided in many ways, most of them would be arbitrary. A powerful non-arbitrary analysis of the human mind is one that rests on function. If

two components of the mind perform different functions, they can be regarded as separate mechanisms.

Evolved Psychological Mechanisms Tend to Be Problem Specific

Imagine giving someone directions to get from Kolkata to a specific street address in Mumbai, Maharashtra. If you gave general directions such as "head west," the person might end up as far south as Bangalore or as far north as Delhi. The general direction would not reliably get the person to the right state.

Now let's suppose that the person did get to the right state. The "head west" direction would be virtually useless because the west of Maharashtra is an ocean. The general direction would not provide any guidance to get to the right city within Maharashtra, let alone the right street address. To get the person to the right state, city, street, and location on that street, you would need to give more specific instructions. Furthermore, although there are many ways to get to a particular street address, some paths will be far more efficient and time-saving than others.

The search for a specific street address on the other side of the country is a good analogy for what is needed to reach a specific adaptive solution. Adaptive problems, like street addresses, are specific—don't get bitten by that snake, select a habitat with running water and places to hide, avoid eating food that contains toxins or parasites, select a mate who is fertile, and so on. There is no such thing as a general adaptive problem (Symons, 1992).

Because adaptive problems are specific, their solutions tend to be specific as well. Just as general instructions fail to get you to the correct location, general solutions fail to get you to the right adaptive solution.

Consider two adaptive problems: selecting the right foods to eat (a survival problem) and selecting the right mate with whom to have children (a reproduction problem). What counts as a "successful solution" differs greatly for the two problems. Successful food selection involves identifying objects that have calories, have particular vitamins and minerals, and do not contain poisonous substances.

Successful mate selection typically involves, among other things, identifying a partner who is fertile and will be a good parent.

What might be a general solution to these two selection problems, and how effective would it be at solving them? One general solution would be "select the first thing that comes along." This would be disastrous because it might lead to eating poisonous plants or marrying an infertile person. If anyone had implemented such a general solution to these adaptive problems in human evolutionary history, he or she would have failed to become one of our ancestors.

To solve these selection problems, one needs more specific guidance about the important qualities of foods and mates. Fruit that looks fresh and

ripe, for example, will signal better nutrients than fruit that looks rotten. People who look young and healthy will be more fertile, on average, than people who look old and ill.

In summary, problem specificity of adaptive mechanisms tends to be favored over generality because (1) general solutions fail to guide the organism to the correct adaptive solutions; (2) even if they do work, general solutions lead to too many errors and thus are costly to the organism; and (3) what constitutes a "successful solution" differs from problem to problem.

Humans Possess Many Evolved Psychological Mechanisms:

Humans, like most organisms, face a large number of adaptive problems. The problems of survival alone number in hundreds—problems of thermal regulation (being too cold or too hot), avoiding predators and parasites, ingesting life-sustaining foods, avoiding falls from great heights, staying away from dangerous strangers, and so on. Then there are problems of mating such as selecting, attracting, and keeping a good mate and getting rid of a bad mate. There are also problems of parenting such as breastfeeding, weaning, socializing, and attending to the varying needs of different children.

Then there are the problems of investing in kin, such as brothers, sisters, nephews, and nieces; dealing with social conflicts; defending against aggressive groups; and grappling with the social hierarchy. Because specific problems require specific solutions, numerous specific problems will require numerous specific solutions. Just as our bodies contain thousands of specific mechanisms—a heart to pump blood, lungs for oxygen uptake, a liver to filter out toxins— the mind, according to this analysis, must also contain hundreds or thousands of specific mechanisms. Because a large number of different adaptive problems cannot be solved with just a few mechanisms, the human mind must be made up of a large number of evolved psychological mechanisms.

The Specificity, Complexity, and Numerousness of Evolved Psychological Mechanisms Give Humans Behavioral Flexibility

The definition of a psychological mechanism, including the key components of input, decision rules, and output, highlights why adaptations are not rigid "instincts" that invariably manifest in behavior. Let us consider the callus-producing example again. The callus-producing mechanisms that have evolved to protect the structures beneath the skin. You can design your environment so that you don't experience repeated friction. In this case, your callus-producing mechanisms will not be activated. The activation of the mechanisms depends on input from the environment. In the same way, all psychological mechanisms require input for their activation.

Psychological mechanisms are not like instincts for another important reason— the decision rules. Decision rules are "if, then" procedures such as "if the snake looks dangerous, then run for your life" or "if the person

I'm attracted to shows interest, then smile." For most mechanisms, these decision rules permit at least several possible response options. Even in the simple case of encountering a deadly snake, you have the option of attacking it with a stick, freezing and hoping it will go away, or fleeing for your life.

Humans gain flexibility from having a large number of complex, specific, functional psychological mechanisms. With each new mechanism that is added to the mind, an organism can perform a new task.

Beyond Domain-Specific Psychological Mechanisms:

All of the evidences point out that humans must possess a large number of specialized psychological mechanisms, each dedicated to solving specific adaptive problems. This conclusion is widely accepted within the field of evolutionary psychology and lies at the foundation of evolutionary approaches to all species (Alcock, 2013).

The idea that a single generic substance can see in depth, control the hands, attract a mate, bring up children, elude predators, outsmart prey, and so on, without some degree of specialization, is not credible.

Some evolutionary psychologists argue that in addition to specific mechanisms, humans also have evolved several domain-general mechanisms (e.g., Chiappe & MacDonald, 2005; Figueredo, Hammond, & McKiernan, 2006; Geary & Huffman, 2002; Livingstone, 1998; Mithen, 1996; Premack, 2010). Examples of proposed general mechanisms are general intelligence, concept formation, analogical reasoning, working memory, and classical conditioning.

The proponents of domain-general mechanisms maintain that although recurrent features of adaptive problems select for specialized adaptations, humans have faced many novel problems that did not recur with sufficient regularity for specific adaptations to have evolved. Furthermore, we know that humans routinely solve ancient adaptive problems in highly novel ways; for example, we can get food from a vending machine, mates from the Internet, and tools from a hardware store. Everyone recognizes that humans have been able to flourish in an environment very different from that in which we evolved, "a constantly changing world far removed from the Pleistocene" (Chiappe & MacDonald, 2005). According to Chiappe and MacDonald (2000) domain-general mechanisms, such as general intelligence, evolved to "allow for the solution of non-recurrent problems in attaining evolutionary goals" (2005) or to develop new solutions to old problems.

There is a debate whether psychological mechanisms are domain-general or domain-specific. It can be summarized that evolved psychological mechanisms clearly interact with each other in complex ways. They are turned on and off in various sequences that are not fully understood. The possibility that humans possess evolved superordinate regulatory mechanisms remains promising and awaits future research.

2.4 LEARNING, CULTURE, AND EVOLVED PSYCHOLOGICAL MECHANISMS

A common question that arises: Aren't the human behaviors we observe caused by learning and culture, not evolution? Aren't human behaviors the product of nurture, not nature? To answer these questions, we must analyze the precise form of explanations that invoke psychological adaptations and the form of those that invoke learning and culture.

To start with, the framework of evolutionary psychology dissolves dichotomies such as "nature versus nurture," "innate versus learned," and "biological versus cultural." If you go back to the definition of evolved psychological mechanisms, you will note that (1) environments featuring recurrent selection pressure over deep time formed each mechanism; (2) environmental input during a person's development is necessary for the emergence of each mechanism; and (3) environmental input is necessary for the activation of each mechanism. Thus, it does not make sense to ask whether a callus or jealous behavior is "evolved" or "learned." "Evolved" is not the opposite of "learned." All behavior requires evolved psychological mechanisms combined with environmental input at each stage in the causal chain.

We can ask the question precisely what it means to say that something is learned. Humans do learn, of course. They are affected by their environments and cultures. Learning, however, requires structures in the brain—evolved psychological mechanisms—that enable them to learn. The explanatory challenge is not well met simply by slapping the label "learning" on a behaviour. We have to identify the nature of the underlying learning mechanisms that enable humans to change their behaviour as a consequence of environmental input. Now, what is the nature of these learning mechanisms? Let's consider three concrete examples: (1) people learn to avoid having sex with their close genetic relatives (learned incest avoidance); (2) people learn to avoid eating foods that may contain toxins (learned food aversions); (3) people learn from their local culture which actions increase social status and prestige (learned prestige criteria). There is compelling evidence that each of these forms of learning are best explained by different evolved learning mechanisms.

Solving the adaptive problem of incest avoidance requires learning about a class of individuals—one's close genetic relatives—with whom one should not have sex. How can people learn who these individuals are? The evolved incest avoidance learning mechanism functions by using a reliable kinship cue—those with whom you grow up. Duration of co-residence with a member of the opposite sex during childhood powerfully predicts a lack of sexual attraction—and the amount of repulsion people experience at the thought of having sex with them (Lieberman, Tooby, & Cosmides, 2003).

Now let us consider learned food aversions. We learn food aversions through a mechanism that makes us feel nauseous after we consume

certain foods. Those who have an intense dislike of mushrooms or liver or fish typically have experienced an earlier event in which they got sick after consuming such food.

Finally, consider how we learn which cues in our local culture are linked with status and prestige. Among hunter-gatherer societies, good hunting skills lead to prestige. In academia, individuals who have prominent publications that are cited a lot by other scholars attain high prestige. Among other local cultures, the number of tattoos, size of motorcycle, or skill at guitar playing or video game playing is associated with high prestige. People learn prestige criteria, in part, by focusing on the attention structure—those high in prestige are typically those to whom the most people pay the most attention (Chance, 1967). By attending to (and often trying to imitate) the qualities, clothing styles, and behaviours of those to whom others pay the most attention, we learn the prestige criteria of our local culture (Atkisson & O'Brien, 2012).

These three forms of learning—incest avoidance, food aversion, and prestige criteria— clearly require different evolved learning mechanisms to function. Each form operates on the basis of inputs from a different set of cues—co-residence during development, nausea paired with food ingestion, and the attention structure, respectively. Each has different functional output—lack of sexual attraction to genetic relatives, disgust at the sight and smell of certain substances, and attention to those to whom others are attending. And importantly, each form of learning solves a different adaptive problem.

There are three critical points to draw from this analysis. First, labelling something as "learned" does not provide an explanation; it is simply a description that environmental input changes the organism in some way. Second, "learned" and "evolved" are not competing explanations; rather, learning requires psychological adaptations. Third, evolved learning mechanisms are often specific in nature.

2.5 METHODS FOR TESTING EVOLUTIONARY HYPOTHESES

Once hypotheses are formulated, the next step is to test them empirically. Evolutionary psychologists have proposed many methods to test the hypotheses (Schmitt, 2008; Simpson & Campbell, 2005). (Table 2.1).

Methods for Testing Evolutionary Hypotheses	Sources of Data for Testing Evolutionary Hypotheses
1. Compare different species	1. Archaeological records
2. Cross-cultural methods	2. Data from hunter-gatherer societies
3. Physiological and brain imaging methods	3. Observations

4. Genetic methods	4. Self-reports
5. Compare male and female records	5. Life-history data and public
6. Compare individuals within a species	6. Human products
7. Compare the same individuals in different contexts	
8. Experimental methods	

Table 2.1 Methods and Data Sources for Testing Evolutionary Hypotheses

Source: Evolutionary Psychology: The New Science of the Mind by David Buss, 5th Ed.

Comparing Different Species:

Comparing species that differ along particular dimensions provides one source of evidence for testing functional hypotheses. The comparative method involves "testing predictions about the occurrence of the trait among species other than the animals whose behavior the researcher is trying to understand" (Alcock, 1993). For example, let us consider the following **sperm competition hypothesis**: The function of producing large sperm volume is to displace competing males' sperm and hence increase the odds of fertilizing a female's egg.

One strategy for testing this hypothesis is to compare species that differ in the prevalence of sperm competition. In highly monogamous species, sperm competition is rare or absent. In certain species of birds (e.g., ring doves) and mammals (e.g., gibbons), males and females pair off to produce offspring and rarely have sex outside the pair-bond.

In other species, such as bonobo chimpanzees, females will copulate with a number of males (de Waal, 2006). In this species, there is a great deal of sperm competition. Thus, we know that sperm competition is high in promiscuous species and low in monogamous species.

Now let us test this hypothesis. We can line up species by the degree to which sperm competition is likely to be prevalent. Among primates, for example, gorillas are least promiscuous, followed by orangutans, humans, and chimpanzees, which are the most promiscuous. Next, we can obtain comparative data on the sperm volume in each of these species as indicated by testicular weight, corrected for body size. The prediction from the sperm competition hypothesis is that males in species that show a lot of sperm competition should have higher testicular weight (indicating a high volume of sperm) compared with species that show lower levels of sperm competition.

The comparative evidence reveals that the testes of male gorillas account for 0.02 percent of body weight; of male orangutans, 0.05 percent of body weight; of human males, 0.08 percent of body weight; and of the highly

promiscuous chimpanzees, 0.27 percent of body weight (Short, 1979; Smith, 1984). In sum, males in the species showing intense sperm competition display larger testicular volume; males in the species with the least sperm competition display the lowest testicular volume

Cross-Cultural Methods:

Cross-cultural methods provide valuable tools for testing evolutionary psychological hypotheses (Schmitt, 2008). The most obvious method pertains to adaptations that are hypothesized to be universal, such as basic emotions (Ekman, 1973), adaptations for cooperation (Cosmides & Tooby, 2005), or sex-differentiated mating strategies (Lippa, 2009; Schmitt, 2005). Comparing different cultures can also be used to examine Adaptations hypothesized to respond to differing ecologies. Mate preferences, for example, have been hypothesized to be sensitive to ecological variations in parasite prevalence, which has been confirmed in a study of thirty-seven cultures (Gangestad, Haselton, & Buss, 2006).

Cross-cultural methods can also be used to test competing theories by pitting them against each other. Lippa, Collaer, and Peters (2010) **explored gender differences in a mental rotation task across fifty-three cultures.** Mental rotation ability has been hypothesized to be part of a male hunting adaptation because hunters have to anticipate the trajectories of spears and other hunting implements as they move through space to coincide with the trajectory of a moving animal. In contrast, according to social role theory, psychological gender differences are hypothesized to be a function of the roles assigned by different cultures, and hence should diminish as equality between the sexes increases. Lippa's cross-cultural study found two key findings: (1) the gender differences in mental rotation ability were universal across cultures, and (2) contrary to social role theory, the gender differences were actually somewhat larger in cultures with more gender equality. Cross-cultural methods, in short, are extremely valuable for testing a range of evolutionary hypotheses, as well as for pitting competing hypotheses against each other.

Physiological and Brain Imaging Methods:

Physiological methods can be used to assess phenomena such as emotional arousal, sexual arousal, and stress. These methods can be used both to identify the biological substrates of psychological adaptations as well as to test hypotheses about design features of those adaptations. Flinn, Ward, and Noone (2005) tested the hypothesis that **children living with stepparents would experience higher levels of stress than children living with two biological parents.** They found that stepchildren had higher levels of cortisol—one of the key hormones that gets released when people experience stress—than non-stepchildren. Another study confirmed the hypothesis that testosterone, one of the key hormones involved in mate competition, would be reduced in men who were in committed romantic relationships (McIntyre et al., 2006). In sum, physiological methods

become valuable both in testing hypotheses about adaptations as well as in identifying the underlying substrates of adaptations.

Brain imaging techniques, such as functional magnetic resonance imaging (fMRI), are increasingly being used to test hypotheses about adaptations and their underlying neural basis. FMRI methods have been used to test hypotheses about adaptations for kin recognition, language, spatial cognition, romantic attraction, and jealousy (Platek, Keenan, & Shackelford, 2007).

Genetic Methods:

Genetic methods, such as twin studies and adoption studies, can be used to test some evolutionary hypotheses (Segal, 2011). One evolutionary **hypothesis proposes a context-dependent adaptation in females to shift to early onset of sexuality and age of first menstruation when growing up without an investing father around**, compared to a delayed onset of sexuality when there is an investing father (e.g., Belsky, 1997; Ellis, 2011). Behavioral genetic methods can determine whether individual differences in onset of female sexuality is environmentally mediated, as the evolutionary hypothesis suggests, or instead is genetically mediated, which would refute the hypothesis.

Comparing Males and Females:

Sexually reproducing species usually come in two forms: male and female. Comparing the sexes provide another method for testing hypotheses about adaptation. One strategy involves analyzing the different adaptive problems faced by males and females. In species with internal female fertilization, for example, males face the adaptive problem of "paternity uncertainty." They never can "know" with complete certainty whether they are the genetic father of their mate's offspring. The females, however, do not confront this adaptive problem. They "know" that their own eggs, not a rival's eggs, are fertilized because the eggs can only come from within themselves.

Males have evolved specific adaptations that function to increase their chances of paternity. One example will explain the point here: male sexual jealousy. Although both sexes are equally jealous overall, studies have shown that men's jealousy, far more than women's, is activated specifically by signals of sexual infidelity, suggesting one solution to the problem of paternity uncertainty (Buss, Larsen, Westen, & Semmelroth, 1992; Schützwohl, 2008). Men's jealousy motivates behavior to repel a rival or to dissuade a mate from infidelity.

The fact that men's jealousy is especially triggered by cues to sexual infidelity points to a facet of men's psychology that corresponds to a sex-linked adaptive problem—that of uncertainty of parenthood. In sum, comparing the sexes within one species can be a powerful method of testing evolutionary hypotheses.

Comparing Individuals within a Species:

Another method involves comparing some individuals with other individuals within one species. Consider young and older women. Teenage girls have many years of potential reproduction ahead of them; women in their late thirties have fewer fertile years left.

We can use these differences to formulate and test hypotheses about adaptation. For example, suppose you hypothesized that younger women would be more likely to abort a developing fetus than older women if there weren't an investing man around to help. The evolutionary rationale is this: Because they have many reproductive years left, younger women can "afford" to lose the chance to have a child to wait for a more opportune time to reproduce. The older woman may not get another chance to have a child. Comparing the rates of abortion, miscarriage, and infanticide in the two groups of women provides one method for testing this hypothesis.

Comparing individuals within a species is not restricted only to age. We can compare individuals who are poor to those who are rich to test the hypothesis that the poor will engage in "riskier" strategies of acquiring resources; the rich might be more "conservative" to protect their wealth. We can compare individuals who differ in their desirability as mates or individuals who differ in the sizes of their extended families. In short, within-species comparison constitutes a powerful method for testing evolutionary hypotheses about adaptation.

Comparing the Same Individuals in Different Contexts:

Another approach is to compare the same individuals in different situations. For example, among the Siriono of eastern Bolivia, one man who was an unsuccessful hunter had lost several wives to men who were better hunters. He suffered a loss of status within the group, due to both his poor hunting and his loss of wives to other men.

Anthropologist A. R. Holmberg (1950) took up hunting with this man, gave him game that others were later told the man had killed, and taught him the art of killing game with a shotgun. Eventually, as a result of the man's increased hunting success, he enjoyed an increase in social status, attracted several women as sex partners, and started insulting others rather than being the victim of insults.

Comparing the same individuals in different situations is a powerful method for understanding evolved psychological mechanisms. **Hypotheses can be formulated about the adaptive problems confronted in two different situations** and hence about which psychological adaptations will be activated in each. In the case of the Siriono man who went from low to high-status thanks to a change in his hunting ability, the higher status apparently caused him to be more self-confident. It also seems to have affected the psychological mechanisms of other Siriono men, who shifted from insulting the man to being more respectful.

Experimental Methods:

In experiments, one group of subjects is typically exposed to a "manipulation" and a second group serves as a "control." Let's say that we develop **a hypothesis about the effect of threat on the tightness of "in-group cohesion."** The **hypothesis states that humans have evolved a psychological adaptation whose function is to react to threats from the outside**, such as an invasion by a hostile group of humans. Under threat conditions, group cohesion should increase, as manifested by such tendencies as showing favoritism toward in-group members and showing an increase in prejudice toward outgroup members.

In the laboratory, experimenters choose one group of subjects at random and tell them they may have to go to a smaller room because another group has first priority on the room they are in. Before they leave, the experimenter gives them $100 as payment for participating in the study, with instructions to divide the money between the two groups however they want. The control group is also charged with dividing the money between their group and another group but is not told that the other group is taking over their room. We can then compare how the control group and the experimental group decide to split up the money. If there is no difference between the experimental and control groups, we would conclude that our prediction had failed. If the threatened group allocated more money to itself but the control group allocated equally, then our prediction would be confirmed—external threat increases in-group favouritism. In sum, the experimental method—subjecting different groups to different conditions—can be used to test hypotheses about adaptations.

2.6 SOURCES OF DATA FOR TESTING EVOLUTIONARY HYPOTHESES

In addition to the research methods, evolutionary psychologists have a wealth of other sources from which they can obtain data for testing hypotheses. This section briefly presents some of these sources.

Archaeological Records:

Bone fragments secured from around the world reveal a paleontological record filled with interesting artefacts. Through carbon-dating methods, we can obtain rough estimates of the ages of skulls and skeletons and trace the evolution of brain size through the millennia. Bones from large game animals found at ancestral campsites can reveal how our ancestors solved the adaptive problem of securing food. Fossilized feces can provide information about other features of the ancestral diet. Analyses of bone fragments can also reveal sources of injury, disease, and death. The archaeological record provides one set of clues about how we lived and evolved and the nature of the adaptive problems our ancestors confronted.

Data from Hunter-Gatherer Societies:

Current studies of traditional peoples, especially those relatively isolated from Western civilization, also provide a rich source of data for testing evolutionary hypotheses. Studies by anthropologists Kim Hill and Hillard Kaplan (1988) show that successful hunters do not benefit directly from their efforts because meat is shared by the group, but they do benefit in other reproductively relevant ways. The children of successful hunters receive more care and attention from the group, resulting in their superior health. Successful hunters also are sexually attractive to women and tend to have more mistresses and more desirable wives. This data source provides evidence that, in conjunction with other sources of data, allows us to formulate and test hypotheses about psychological adaptations.

Observations:

Systematic observations provide a third method for testing evolutionary hypotheses. Anthropologist Mark Flinn devised a behavioral scanning technique for systematically gathering observations in Trinidad (Flinn, 1988; Flinn, Ward, & Noone, 2005). Every day, he walked through the argeted village, visiting every household and recording each observation he made on a record sheet. He was able to confirm, for example, the hypothesis that men with fertile wives engaged in more intense "mate guarding" than men with less fertile wives (i.e., those who were pregnant or old). He determined this through behavioural scans that showed that men tended to get into more fights with other men when their wives were fertile and fewer fights when their wives were not fertile. Observational data can be collected from a variety of sources—trained observers such as Flinn, husbands or wives of the target subjects, friends and relatives, even casual acquaintances.

Self-Reports:

Reports by the actual subjects provide an invaluable source of data. Self-report data can be secured through interviews or questionnaires. There are some psychological phenomena that can be examined only through self-report. Consider sexual fantasies. These are private experiences that leave no fossils and cannot be observed by outsiders. In one study, evolutionary psychologists Bruce Ellis and Donald Symons (1990) tested hypotheses about sex differences in sexual fantasy. They found that men's sexual fantasies tended to involve more sexual partners and more partner switching and were more visually oriented. Women's sexual fantasies tended to have more mystery, romance, emotional expressions, and context. Without self-report, this sort of study could not be conducted.

Life-History Data and Public Records:

People leave traces of their lives on public documents. Marriages and divorces, births and deaths, crimes and misdemeanors, are all part of the public record. In one series of studies, the evolutionary biologist Bobbi Low (1991) was able to unearth data on marriages, divorces, and remarriages from different parishes in Sweden recorded many centuries

ago. The priests of these parishes kept scrupulously accurate and detailed records of these public events. By looking at marriage and divorce rates from 400 years ago, we can see whether the patterns that occur today are long-standing and recurrent over human history or merely products of our modern times. Low was able to test a number of evolutionary hypotheses using these public records. She confirmed, for example, that wealthier men tended to marry younger (and hence more fertile) women compared with poorer men.

Public records if used in conjunction with other sources of data, can be very useful for scientists to test evolutionary psychological hypotheses.

Human Products:

The things humans make are products of their evolved minds. Modern fast-food restaurants, for example, are products of evolved taste preferences. Hamburgers, French fries, milkshakes, and pizza are filled with fat, sugar, salt, and protein. They sell well precisely because they correspond to, and exploit, evolved desires for these substances. Thus, food creations reveal evolved taste preferences. Human creations can serve as an additional data source for testing evolutionary hypotheses.

2.7 USE & MISUSE OF DARWINISM

According to Darwin's theory of evolution, only the plants and animals best adapted to their environment will survive to reproduce and transfer their genes to the next generation. Animals and plants that are poorly adapted to their environment will not survive to reproduce.

Charles Darwin published his notions on natural selection and the theory of evolution in his influential 1859 book On the Origin of Species.

Darwin's theory of evolution by natural selection was a scientific theory focused on explaining his observations about biological diversity and why different species of plants and animals look different.

Social Darwinism is a loose set of ideologies that emerged in the late 1800s in which Charles Darwin's theory of evolution by natural selection was used to justify certain political, social, or economic views. Social Darwinists believe in "survival of the fittest"—the idea that certain people become powerful in society because they are innately better. Social Darwinism has been used to justify imperialism, racism, eugenics and social inequality at various times over the past century and a half.

For evolutionary scientists there is no such thing as "Darwinism". Instead, we have a scientific theory that, in combination with Mendel's work, provides the modern or neo-Darwinian synthesis, which explains the development of life on Earth.

This effectively sets the limits of the usefulness of Darwin's theory. However, in the last 150 years, there have been many attempts to take Darwin's idea and apply it outside of the context for which it was

developed, hence the influence of social "Darwinism" on concepts such as eugenics and a more recent Darwinian nihilism that absolves the individual of any moral or social responsibility.

There is an inherent danger in extrapolating science beyond the realm for which it was intended, but ironically this human trait is perhaps best understood as an evolutionary hangover from the development of our massively expanded brainpower. We have an innate need to expand and develop ideas in order to explain our wider existence or justify our behaviours.

This inherent danger of using Darwin's theory outside of its biological context has led to attempts to portray Darwin as the de facto cause of 20th century genocide. There is a fallacy at the core of this line of thinking – can scientists really be held responsible for what is done with their ideas when they are misunderstood and corrupted by groups such as the Nazis? It is argued that they cannot: the actions of criminals do not need such highbrow justification and trying to do so merely lends a pseudo-scientific veneer the actions of the Third Reich.

A newer and perhaps more insidious attempt to blame "Darwinism" for human atrocity comes in the form of Dennis Sewell's book The Political Gene: How Darwin's Ideas Changed Politics.

Sewell cites Darwin's work as the reason for the development of something that he broadly categorises as a form of moral detachment from societal rules and norms: evolution is random and without purpose therefore one can do whatever one pleases.

He argues that this moral vacuum can lead to disturbed teenagers perpetrating horrific crimes such as the Columbine school massacre. Sewell does not propose that Darwin's theory leads inevitably to such actions, however he suggests that some of Darwin's other writings were racist and not in keeping with modern views. This is hardly a stunning revelation: Darwin was a man of his time and of his society. Sewell is making a common mistake in grafting the faults and flaws of Darwin the man onto Darwinian evolution.

An interesting parallel can be seen in how Islamists subvert the essentially peaceful message of Islam into a justification for violence and vitriolic hate. One can no more blame the actions of misguided Islamists on Muhammad than the Nazis or high school shooters can be blamed on Darwin.

Humans have a tremendous capacity for selflessness and creativity but we also have an equally developed ability to cause destruction and misery. Both extremes are a result of our evolutionary heritage. If we blame Darwin for the dark side of human nature, logically we must also credit him with all that is good.

Darwin theory of natural selection and evolution was widely and horribly misused from the moment he discovered it. His theory was that “As long

as the conditions of life remain the same, we have reason to believe that modification, which many generations have inherited, may continue to be inherited". This shows that nature chooses who lives and dies due to what traits they have inherited. In simple terms, all the problems branching from Darwin's theory is all based on Eugenics. A problem followed this discovery because it gave people excuses to get what they want.

Thousands of citizens being forced to give up having the ability to have children because they weren't "adequate enough" by the government was an awful turning of Darwin's theory. For example, in 1927, the supreme court and other branches of government forced a woman to have to get sterilized or to be unable to have children. One justice wrote afterwards that "Carrie Buck is a feebleminded white woman… [who was a] probable potential parent of socially inadequate offspring". This shows that they twisted the idea of natural selection to their idea that inadequate people will produce inadequate children.

In addition, by 1935, all states but 11 had had sterilization laws either in effect, or pending. Also, by that time, it was "[estimated] that 65,000 Americans were sterilized without consent under these laws". The government was forcing thousands of adults to give up their free will and get sterilized so that there wouldn't be "inadequate" children. As a result, they used natural selection as an excuse to restrict child birth to the general population so that the special few could have "adequate" children.

Racism was already a huge problem with many people, so natural selection just gave them the opportunity to make use out of it, however bad it was. For example, by 1919, the amount of people immigrating increased to about 6 million per decade. This caused Laughlin to said that new immigrants had high levels of "feeblemindedness, insanity, criminality, and dependency".

An addition, by 1919, most of the population was coming from southern, eastern, and central Europe. Laughlin said in his testimony to abolish immigration, the immigrants should take a test and "[They] should also be dependent upon the possession of such physical, mental, and moral qualities as the American people desire to be possessed inherently by its future citizenry". Laughlin is using natural selection as an excuse that immigrants aren't good enough for us and should be restricted. He had the opinion that people who weren't white typically weren't pure enough for us. They had used natural selection to get their own personal goals accomplished, even if it is not morally or socially correct.

Many people through time have agreed that in life, only the strongest will come out on top and if you are not strong or smart enough you will not "survive" society. As Herbert Spencer had written about, "Radical defects are as much causes of death in the one case as in the other". Also, he talks about how if you have "incompleteness be in strength, agility, perception, foresight, or self-control is not heeded, [nature will] purify society from those who are, in some respect or other, essentially faulty". He, in simple

terms, is saying that if you are not good enough, you will not survive in the current society.

In addition, Francis Galton added a theory that humans inherited what he called "noble" human traits, like superior intelligence or abilities. On the same subject, he felt that there was a "superior [strain]or [race]. In so favouring them their progeny shall outnumber and gradually replace that of the old one". He is saying that the white man race is better than the other races, and that if you are not white, you will never be the strongest. They used Darwin's theory incorrectly to show that if your parents weren't full white, then the traits inherited from your parents would be "weak" and you would not survive.

Darwin's theory was misused on the misguided idea of Eugenics. All the problems coming from it (Sterilization, Racism, Survival of the Fittest) are all on the idea of traits and DNA strands. Throughout history, hundreds of thousands of people have died to Eugenics. The holocaust was due to Hitler thinking the Jews were not good enough along with other lasting events such as Racism. If Darwin's ideas were not misinterpreted, thousands upon thousands of lives would have been greatly different.

2.8 SUMMARY

This chapter covered five topics: the definition of an evolved psychological mechanism, properties of evolved psychological mechanisms, methods for testing evolutionary hypotheses, sources of data for testing evolutionary hypotheses, and use and misuse of Darwinism.

The logic of evolutionary hypotheses starts with an examination of the four levels of analysis, going from most general to most specific—general evolutionary theory, middle-level evolutionary theories, specific evolutionary hypotheses, and specific predictions about empirical phenomena derived from these hypotheses. One method of hypothesis generation is to start at the higher levels and move down. A middle-level theory can produce several hypotheses, each of which in turn yields several testable predictions. This can be described as the "top-down" strategy of hypothesis and prediction formation.

A second method is to start with a phenomenon known or observed to exist, such as the importance men attach to a woman's appearance. From this phenomenon, one can generate hypotheses about the possible function for which it was designed. This bottom-up method is called reverse engineering and is a useful supplement to the top-down method.

The evolutionary process produces three products: adaptations, by-products of adaptations, and random effects or noise. Evolutionary psychologists tend to focus on adaptations. More specifically, they focus on one special subclass of adaptations that comprises human nature: psychological mechanisms.

Psychological mechanisms are information-processing devices that exist in the form they do because they have solved specific problems of survival

or reproduction recurrently over human evolutionary history. They are designed to take in only a narrow slice of information, transform that information through decision rules, and produce output in the form of physiological activity, information to other psychological mechanisms, or manifest behavior. The output of an evolved psychological mechanism is directed toward the solution to a specific adaptive problem. Evolved psychological mechanisms provide non-arbitrary criteria for "carving the mind at its joints," which tend to be problem-specific, are large in number, and are functional in nature.

Once a hypothesis about an evolved psychological mechanism is formulated, the next step in the scientific endeavor is to test it. Testing evolutionary hypotheses relies on comparisons, finding out whether groups that are predicted to differ in a particular way actually do. This method can be used to test hypotheses by comparing different species, comparing people in different cultures, comparing people's physiological reactions and brain images, comparing people with different genes, comparing males and females within a species, comparing different individuals of each sex, and comparing the same individuals in different contexts.

Evolutionary psychology has a wealth of additional sources to draw on, including the archeological record, contemporary hunter-gatherer societies, self-report, observer report, data evoked from subjects in laboratory experiments, life-history data from public records, and products made by people.

Every source of data has strengths, but each also has limitations. Each provides information that typically cannot be obtained in the same form through other data sources. And each has flaws and weaknesses not shared by others. Studies that test evolutionary hypotheses using two or more data sources are better than studies that rely on a single source.

The final section of this chapter outlined major classes of adaptive problems. Four classes of adaptive problems follow from modern evolutionary theory: problems of survival and growth, problems of mating, problems of parenting, and problems of genetic relatives. Additional insights into identifying adaptive problems come from knowledge of universal human structures, traditional tribal societies, paleoarcheology, task analysis, and current psychological mechanisms. Current mechanisms such as a fear of heights, a taste for fatty foods, and a preference for savanna-like landscapes provide windows for viewing the nature of past adaptive problems.

In the end, we discussed the use and misuse of Darwinism. Darwin's theory was misused on the misguided idea of Eugenics. All the problems coming from it (Sterilization, Racism, Survival of the Fittest) are all on the idea of traits and DNA strands. Throughout history, hundreds of thousands of people have died to Eugenics. The holocaust was due to Hitler thinking the Jews were not good enough along with other lasting events such as

Racism. If Darwin's ideas were not misinterpreted, thousands upon thousands of lives would have been greatly different.

2.9 QUESTIONS

Q 1 Define evolved psychological mechanism.

Q 2 Describe properties of evolved psychological mechanisms.

Q 3 Discuss the methods for testing evolutionary hypotheses.

Q4 Write Short Notes

1. Physiological and Brain Imaging Methods
2. Sources of Data for Testing Evolutionary Hypotheses
3. Use & misuse of Darwinism

2.10 REFERENCES

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3

MAJOR ASPECTS OF EVOLUTIONARY THEORY: SURVIVAL AND MATING- I

Unit Structure

3.0 OBJECTIVES

After studying this unit you should be able to:

- know what are the problems of survival
- Understand food acquisition
- Know about human fears and six defenses in depth.
- Study landscape preferences
- Understand mate selection
- Study sexual strategies and problems confronted by men and women

3.1 PROBLEMS OF SURVIVAL

Surviving i.e. continuing to live even though there are dangers around us, can be difficult. According to Darwin, dangers to survival are called "hostile forces of nature." They include extreme climate, shortages of food, toxins, diseases, parasites, predators etc. Humans have evolved adaptions to fight these barriers to survival. But there are some evolved mechanisms that help us to survive. In this unit, we are going to talk about some problems of survival. They are food acquisition, human fears and landscape preferences.

3.1.1 Food Acquisition:

We all know that we cannot live without food and water. Nowadays, obtaining food and water is comparatively easy,.i.e. We know where exactly we can get food, its contents, and obviously, we know what we are eating is not poisonous. But hundreds of years ago, the scenario was different. Our ancestors had to face many problems finding food everyday.

While selecting food, two things are important. First one is obtaining adequate amounts of calories, nutrients like sodium, calcium, and zinc etc. Second one is making sure that you are not consuming dangerous levels of toxins, which can result in death. (Rozin & Schull, 1988). To reach this goal, activities like searching for food; recognizing, taking, handling, eating it; and digesting it to absorb its nutrients are required. Species that regularly eat both plants and animals are called omnivores. They eat many kinds of foods—plants, nuts, seeds, fruits, meats etc. It increases the probability of them consuming poison, because toxins are widespread throughout the plant world. Toxins in plants are bad for animals who consume them, but not for plants which are poisonous, because Toxins help plants defend themselves from predators.

As food is our basic need, people spend more money on food than other things. Human infants get all the needed calories from their mothers milk. This prevents them from consuming fatal toxins until they can secure food on their own. Humans (even rats!) have evolved taste preferences for sweet foods; Sweet foods contain rich sources of calories (Birch, 1999; Krebs, 2009). For example, honey has the highest caloric value, and it was the most highly preferred food when a study of food preferences was done among Hadza hunter- gatherers of Tanzania. (Berbesque & Marlowe, 2009). Even newborn human infants show a strong preference for sweet liquids. Humans dislike sour, bitter food which is likely to contain toxins. (Krebs, 2009).

Rats and humans have an adaptation known as neophobia- a strong aversion to new foods. Rats generally have new and unfamiliar food only in very small doses, and they eat the new foods separately, and not together. If the new and unfamiliar food is consumed in small amounts and separately, the rats get a chance to learn what makes them sick, and they can avoid deadly overconsumption of poisons (Birch, 1999).

Do you feel like drinking your soup even after you see a dead fly in your soup bowl?. According to the phenomenon we are going to study now, no. Disgust is an emotion which generally involves feelings of revulsion, nausea. It strongly motivates us to withdraw from the disgust-producing stimulus (In this case, soup bowl with a fly in it).The emotion of disgust is a hypothesized adaptation which acts as a defense against microbial attack and protects people from the risk of disease (Curtis, Aunger, & Rabie, 2004; Oaten, Stevenson, & Case, 2009). If the emotion of disgust is an evolved defense against disease, there are some predictions. First one is that disgust should be evoked most strongly by substances which carry diseases. The second is that these disgust elicitors should be culturally

universal. A third prediction is that disgust should activate the immune system. Empirical resources support the first two predictions (Curtis & Biran, 2001). Foods like rotting flesh, dirty food, bad-smelling food, food leftovers, moldy food, a dead insect in food, and witnessing food preparation by someone with dirty hands are found very disgusting in people from various cultures. There are some gender differences found as well. Women find images showing disease carrying objects to be more disgusting than men do, and they perceive that the risk of disease is higher from those objects as compared to men. The reason could be that women typically take care of their infants and children. They need to protect them from disease, as well as themselves (Curtis et al., 2004).

Some women experience increased sensitivity and nausea towards some food items during the first three months of pregnancy. It is called pregnancy sickness or morning sickness. According to Profet (1992), pregnancy sickness is an adaptation. It prevents mothers from consuming toxins which can be harmful to the baby in the womb. Plants indicate their toxicity with chemicals. For example, cabbage, cauliflower etc. have a strong taste that comes from allylisothiocyanate (Nesse & Williams, 1994). We find these chemicals bitter, unpleasant—adaptations that help us to avoid consuming toxins. If pregnant women consume such types of foods, they are more likely to vomit. But here, vomiting is good as it prevents the toxins from entering the mother's bloodstream (Profet, 1992).

Mostly, foods which are raw- uncooked have high levels of fiber. But They provide few levels of calories when the efforts to chew, digest them are considered. Cooking makes fibrous fruits, tubers, and raw meat more easily digestible. It also frees up energy and kills microorganisms that could be toxic to humans. Cooking hypothesis is given by Richard Wrangham. According to this hypothesis, the invention of fire and ability to cook gave the key evolutionary momentum for the evolution of extraordinarily large human brains. Following evidence supports Wrangham's cooking hypothesis - 1) Cooking food increases its net energy value. 2) Cooking makes food easily digestible. 3) cooking is universally found in humans 4) The calories required by the human brain to function are not adequately provided by fibrous fruits and other raw foods. 5) If consumed raw food diets exclusively, humans progress poorly and many women lose the ability to reproduce.

In our daily life, we eat spicy food very often. Not just in India, it is similar worldwide. Why are we so concerned about spices? According to the antimicrobial hypothesis, spices kill or hinder the growth of microorganisms. They also prevent the production of toxins in the foods. Thus it avoids falling ill or being poisoned by the foods we eat (Sherman & Flaxman, 2001). According to evidence, some spices are very powerful in killing the bacteria in the food, for example, onion, garlic, oregano etc. (Sherman & Hash, 2001). This hypothesis does not say that humans have a specialized evolved adaptation for using spices, but it could be that people found that they were less likely to be ill after eating leftover food cooked with spices.

For at least 24 million years, primates have been eating fruit. Most primates such as chimpanzees, orangutans, and gibbons are mainly frugivorous. Frugivorous means fruit is the mainstay of their diet. The ripest fruits are greatly preferred. They have high amounts of sugar and ethanol. Primates including human beings have been consuming

For millions of years primates, including humans, have been consuming low levels of ethanol by eating ripe fruit. According to the frugivory by-product hypothesis, the human fondness for consuming alcohol is not an adaptation. Rather it's a by-product of adaptive liking for ripe fruit (Dudley, 2002; Singh, 1985). Alcohol has a different taste, unique odor and it is generally associated with color and fragrance of ripe fruits (Singh, 1985). Alcoholism in the contemporary world is likely a maladaptive consequence of the overindulgence of these frugivorous adaptations.

We know that our ancestors were hunters- they used to kill animals for food. Humans eat far more meat when compared to other primate species. For thousands of generations, Meat has been a key aspect of the human diet. It is found that modern tribal societies hunt as a major method for obtaining food. For example, the Aka Pygmies are found in the tropical rain forests of the Central African Republic.They spend about 56 percent of their subsistence time hunting and 17 percent of their subsistence time in processing food (Hewlett, 1991).

Sharing food is a strategy of courtship, an indicator of closeness of relationships and means for adjustment after a conflict (Buss, 2003). Failure to provide food can result in a male losing his status in the group (Hill & Hurtado, 1996; Holmberg, 1950). In Ganda and Thonga tribes in Central Africa, it is common for women to get divorce from husbands who fail to provide food (Betzig, 1989). Various cultures, religions and myths revolve around stories of food and food is frequently used as metaphors (Lakoff & Johnson, 1980).

3.1.2 Human Fears:

All of us have experienced fear and anxiety in our life. They signal danger on specific occasions (Such as seeing a snake in the front yard) . All habitats involve hostile forces that are barriers to human survival. But humans have evolved different types of specific fears in order to avoid these dangers. The adaptive reason for human fear is that they cause us to deal with the source of danger, helping us to survive. (In this case, running away from the snake and reaching a safe place).

According to Marks (1987) and Bracha (2004), there are six ways in which fear and anxiety can protect us. They are freezing, fleeing, fighting, submission or appeasement, fright and fainting.

Table 3.1 Defenses and their explanation

Sr. No	Defenses	Explanation
1	Freezing	This response helps individuals to assess the situation and to hide from the predator. This can sometimes avoid an aggressive attack.
2	Fleeing	This type of response takes an individual away from specific threats. For example, after seeing a snake, running away from the snake may be the safest, easiest way to avoid a snake bite.
3	Fighting	This may include attacking, bashing or hitting the predator which can cause it to flee or destroy it. For example, killing a snake with a stick. It is assessed whether the predator can be successfully repelled.For example, killing a spider is much easier than killing a hungry bear.
4	Submission or appeasement:	Generally, this response works when the threatening being is a member of one's own species. For example, Chimpanzees perform submissive greetings to the alpha male usually to prevent a physical attack. The same could be true for humans.
5	Fright	In this response the person "plays dead" by becoming muscularly immobile. The adaptive advantage of this response takes place during circumstances where fleeing and fighting will not work. For example, if the predator is very fast and strong. Predators are sensitive to movement of the potential prey and they sometimes lose interest in a prey that is not doing any movement for a while (Moskowitz, 2004). The predator might loosen its grip after this response, opening an opportunity for prey to escape from the situation.
6	Faint	Losing consciousness to indicate the attacker that one is not a threat, is the defense of fainting. The hypothesized function of fainting after seeing blood or a sharp weapon is that it helps warfare noncombatants (like women and children) to signal adversaries that they are not an immediate threat and they can be safely ignored. Therefore, fainting might have

		increased their chances of surviving violent conflicts. If this hypothesis is correct then it could be assumed that women and children would be more likely than men to faint after seeing blood, and there is evidence which strongly supports this prediction (Bracha, 2004).

These six behavioral responses to acute threat are adaptively patterned and they generally take place in a predictable sequence (Bracha, 2004). First response is to freeze, allowing a person to avoid detection and to plan how to escape (Moskowitz, 2004). Next response could be fleeing, if you see a bear coming to you. But if that too is unsuccessful, the next response is to fight. If there is no chance of fleeing or fighting, one may respond by frighting, i.e. playing dead. This sequence of defenses also occurs in most mammalian species (Bracha, 2004).

Fear has a predictable set of evolved physiological reactions as well (Marks & Nesse, 1994). A hormone called Epinephrine is produced by fear. It helps blood clotting so that one can sustain a wound. (For example, after having a fight with a bear). It acts on the liver and releases glucose so that muscles can get energy to fight or flight. blood flow increases, it gets diverted to muscles. People breathe more rapidly so that oxygen supply to the muscles increases. All these physical reactions help our body to deal with the danger.

Predators have been a threat to human survival throughout human evolutionary history. For example, animals like lions, tigers, leopards and crocodiles etc. (Brantingham, 1998). We are more likely to develop fears of dangers from our ancestral environment than of dangers in the current environment. For example, snakes are not a big problem in urban cities, but automobiles are. That is, there are more chances of car accidents in urban cities than snake bite. But still, people from cities may go to psychiatrists with fear of snakes rather than fear of cars.

These specific fears tend to emerge at a time when the danger would have been encountered (Marks, 1987). For example, fears of heights and strangers take place when infants are about six months old. At this time only, infants start to crawl away from their caretakers (Scarr & Salapatek, 1970). Crawling increases the risk of contact with dangerous falls, and encounters with strangers, thus the emergence of these fears at this time coincides with the onset of the adaptive problems. There are other kinds of fears emerging at a specific time. For example, separation anxiety peaks between nine and thirteen months of age (Kagan, Kearsley, & Zelazo, 1978). Around age two, a child tries to extensively explore its environment and at this time, animal fears emerge. The fear of being in public places or places from where the escape might be difficult is called Agoraphobia. It emerges as the young individual leaves the home base (Marks & Nesse, 1994). The developmental timing of the coming of fears

tends to correspond accurately to the onset of different adaptive problems i.e. different kinds of threat to an individual's survival.

There are some fears which show clear sex differences. Adult females are more likely than males to develop fears, phobias of snakes, spiders. In two experiments with eleven months old, Rakison (2009) found that this gender difference emerges in infancy. Women show more fear of events in which they might get injured such as robbery, assault, burglary, rape, car accidents (Fetchenhauer & Buunk, 2005). Men are more likely to experience these threats to survival than women, with the exception of rape. According to Fetchenhauer and Buunk, sexual selection has created risk- taking strategies in men order to obtain status, resources and mating chances but in women the strategies are more cautious as they need to protect their offspring (Campbell, 2013).

Table 3.2 shows some common human fears with hypothesized adaptive problems for which they might have evolved (Nesse, 1990).

Table 3.2 Common fears with the adaptive problems

Sr. No.	Types of fears	Adaptive problem
1	Fear of snakes and spiders	Receiving a poisonous bite
2	Fear of heights	Harm from falling from trees, cliffs etc.
3	Disease	Contamination
4	Stranger anxiety	Harm, damage from unfamiliar males
5	Social anxiety	Loss of status, rejection from group

3.1.3 Landscape Preferences:

Where to live and how do we select a place to live? We will see how our ancestors answered this question, in the upcoming theory. Good habitats shall elicit strong positive responses and poor habitats shall elicit weaker or negative responses. Evaluation of habitats, choosing a landscape to live in can be a difficult process. Along with the current state of the landscape, future states such as weather etc. are important. For safe movement through the environment, a great deal of skills, knowledge is needed as well.

According to Orians (1980, 1986), humans prefer to settle in environments where there are abundant resources needed for survival, at the same time avoiding environments which lack resources and are risky for survival.It is widely believed that humans originated in the Savanna of Africa, and these requirements are fulfilled by this land. Also, trees in this area give

protection to sensitive human skin from the harsh sun. It also provides a refuge (places to hide) for escaping from danger. Studies of landscape preferences support the savanna hypothesis. Many researches support the conclusion that Humans prefer natural environments as compared to human-made environments (Kaplan & Kaplan, 1982). A study by Kaplan (1992) summarized findings from 30 different studies where participants rated color photographs or slides on a five-point scale. The studies were different, and included scenes from Western Australia, Egypt, Korea, British Columbia, and the United States. The participants were college students, teenagers, Koreans and Australians. The conclusion of this study was that natural environments are consistently preferred over human made environments and pictures containing trees , vegetation are rated more positively than environments without trees and vegetation (Ulrich, 1983). Also, Ulrich (1986) found that individuals who are placed in a stressful situation show less physiological distress when they are seeing pictures of nature scenes.

The savanna is a home to large terrestrial animals and primates like baboons, chimpanzees. There are more opportunities for obtaining meat than tropical forests, more vegetation for grazing and wide open landscapes which are favorable for nomadic lifestyle (Orians & Heerwagen, 1992). The savanna hypothesis is supported by studies of landscape preferences. We will look at one study in detail. In a study participants from Australia, Argentina, and the United States did an evaluation of a series of pictures of trees taken in Kenya. Each photograph focused on a single tree and pictures were taken in similar daylight and weather. The trees selected for study differed in four qualities- canopy shape, canopy density, trunk height, and branching pattern. Participants from all cultures had similar judgments about the pictures. All had a strong preference for savanna-like trees. They were also likely to dislike skimpy and dense canopies (Orians & Heerwagen, 1992).

According to Orians and Heerwagen (1992), there are three stages of habitat selection. Stage 1 is called as selection. When one comes across a habitat or landscape, they need to decide whether to explore that place or leave. These initial responses tend to be very affective or emotional. Open or completely closed environments are abandoned. If the reaction to stage 1 is positive then people enter stage 2. It can be called information gathering. One tries to explore the environment to see its resources and potential dangers. One may also check if there are places to hide, refuge. According to a study by Kaplan (1992), people have a great fondness for mystery at this stage. They may like paths that wind around a bend until they are out of sight. Mapping includes evaluation of risk. Human beings have poor vision at night so they need protection in darkness. A study done with modern humans found that in their bedrooms, people prefer keeping their bed in a way that they can see the door, as distant from the door as possible and on the location in the room toward which the door opened (Spörrle & Stich, 2010). These results show adaptations against nighttime predators or human aggressors.

Stage 3 of habitat selection can be called exploitation. People decide if they are staying in that habitat to acquire the benefits of the available resources. The decision to stay or leave a habitat includes trade-offs. I.e. The same place that has good availability of food may also have risk of predators (Orians & Heerwagen, 1992). A craggy cliff can help one for surveillance but it also has a risk of falling from that cliff. Each place has a negative as well as positive side, so taking decisions at this stage requires complex cognitive calculations.

3.2 MATE SELECTION

In times of dating applications like tinder, do you wonder how our ancestors selected their mates, i.e. sexual partners? As humans, we do not have an equal desire for every individual of the opposite sex. Everywhere, some people are preferred, some are not. From our ancestors, we have received a certain set of mate preferences. Scientists have documented evolved mate preferences in species other than men. They tried to find out why animals select one particular mate, and not others. For example, we will look at a study of a weaverbird in an African village given by Collias & Collias, (1970). When a female weaverbird enters in the proximity of a male weaverbird, he shows her his nest by hanging on the nest upside down from the bottom. He also vigorously flaps his wings. If this impresses the female then she enters and examines the nest. (This examination can last up to 10 minutes!) While she inspects the nest by poking, pulling the material, he sings for her. If the female thinks that the nest does not meet her standards, she leaves that nest and moves to another male's nest. Like this, a female weaverbird only selects a mate who is able to build a superior nest. She addresses the issue of protecting and provisioning her chicks.

In the act of sexual intercourse, male investment is minimal. But if the female gets pregnant, it produces an obligatory, energy-consuming nine-month investment by her. The activity of breastfeeding is only done by the female. According to Triver's (1972) theory of parental investment and sexual selection, the sex which invests more in the children (which is generally the female) will be more selective, discriminating about mating (intersexual attraction).Here, parental investment can be defined as any investment in the child by the parent which increases the offspring's chances of surviving at the cost of the parents ability to invest in other offspring. Also, the sex that invests in lesser degree in children will be more competitive for sexual access to the other sex which is high-investing (intrasexual competition). When we talk about humans, females have prominent obligatory parental investment. But in long term mating, marriage, both males and females generally invest a lot in children. Thus the theory of parental investment predicts that both females and males shall be very choosy and discriminating.

The second topic is related to mate preferences as evolved psychological mechanisms. How does one individual select a partner based on his/her specific attributes or qualities? The process of selecting a mate involves negotiation and people make this decision after considering a number of

factors. While selecting a mate, one requires psychological mechanisms. These psychological mechanisms enable the addition of relevant attributes and give each attribute correct weight to make the final decision. There may be some attributes that weigh more than others in taking the final decision about choosing or rejecting a mate.

Charles Darwin (1981) proposed sexual selection. It acts to increase the relative attractiveness of people as potential mates. Traits that are attractive to members of the opposite sex are called as sexually selected traits. For example, height is a trait in males which is certainly attractive to females. There are two main considerations about what kind of male a female shall select for mating. First one is the quality of the genes of the mate.i.e. better quality genes generally lead to better quality, more successful offspring. The second consideration is males' capability and desire to contribute to childcare directly or indirectly. In the case of males, the considerations are different. In monogamous pair bonds, males shall be sensitive to indicators of female fertility. Since they are spending a lot of time only with a single female, the more fertile she is, the better it is for them. So if females are chosen based on their fertility, then younger should be better than older as reproductive period of human females terminates at menopause.

Almost universally, spousal age differences and studies of marriage data show a similar pattern which is reported from mate choice preference studies. The spousal age difference generally increases as the husband's age at the time of marriage increases. The tendency for women to prefer men whose status is better than their own is seen. This tendency leads to hypergyny, i.e. women marrying up the social scale.

David Perrett and his colleagues did research on facial attractiveness. Their results reveal that female preferences for specific male faces differ during the menstrual cycle. They used digitally morphed pictures and showed that when women are in the ovulatory i.e. most fertile period of their cycle, they favor a more masculinized version of a face. Women in this phase are more attracted to faces which have features like larger and squarer jaws, high cheekbones and salient brow-ridges. All these features reflect high levels of the male hormone called testosterone. But during the non-fertile stage of their cycle females show a preference for the feminized versions of the same faces. One interpretation from this data is that when women are likely to conceive they prefer cues that suggest good genes but at other times they prefer cues which indicate the male is less dominant and tends to invest in a relationship and parenting. This interpretation is well adjusted with questionnaire-based studies. These studies suggest that women prefer heroes for one-night stands and altruists as their long term mates, friends. Thus, one sex’s attempt to enhance its reproductive performance can influence the mating strategies of the other sex.

There are consistent results that show that more symmetrical individuals get higher ratings of attractiveness, are more aggressive and they perform better in competitive areas. Males who are symmetrical appear more

attractive to females. Women report higher number of orgasm with more symmetrical male partners. This high frequency of orgasm probably results in high sperm retention, which has a direct effect on he male's fitness. Some evidence suggests that females are able to smell male symmetry. Researchers Steve Gangestad and Randy Thornhill from t asked women to rate the smell of T-shirts. These T- shirts had been worn by symmetrical and asymmetrical men for two nights. The findings revealed that women who were at or near the most fertile phase of their cycle much preferred the smell of the T-shirts which were worn by the symmetrical men. However, women who were in the infertile phase of their cycle, and women who were using oral contraceptives reported no preference.

3.3 SEXUAL STRATEGIES

Mating relationships can last for short, as well as long durations. Matings of short duration can be called brief affairs, one night stands, etc. Both sexes engage in long term and short term mating. People are likely to mate with someone who is similar to them. Sexual strategies theory is given by Buss and Schmitt (1993). According to this theory, human mating is inherently strategic. Human beings seek specific mates to solve certain adaptive problems that their ancestors faced during human evolution. Mate preferences and mating decisions of human beings are hypothesized to be strategic products of selection pressures which were operating during ancestral conditions.

Here, the term strategy indicates the goal directed and problem solving nature of human mating behavior. Strategies can be defined as evolved solutions to adaptive problems. It does not imply that the strategies are consciously planned. According to sexual strategies theory, mating strategies are context dependent. They are highly sensitive to the temporal context of long term versus short term mateships.

Summary of this theory is as follows- In history of human evolution, both men and women have pursued short and long term matings, where reproductive benefits were more than the costs. When pursuing a short term sexual strategy, different adaptive problems must be solved, as opposed to long term sexual strategy. There is fundamental asymmetry between men and women in the minimum levels of parental investment. Because of this, men allot a larger proportion of their total mating efforts to short term mating, as compared to women. The reproductive opportunities and constraints are different in men and women in long term and short term mating. Thus, the adaptive problems that women must solve while pursuing each strategy are different from the problems men must solve, in these contexts. However some problems are common in both sexes.

Historically, men have been inhibited in their reproductive success mainly by the number of the fertile women they can inseminate. This reproductive constraint on men can be divided into four different types of problems. Historically, men needed to solve these problems in order to effectively

pursue a short term mating strategy. These problems are as follows- the problem of partner number, the problem of identifying which women are sexually accessible and fertile, and the problem of minimize investment and commitment. Now we come to reproductive constraints on men which they had to solve in order to effectively pursue a long term mating strategy. These can be divided into four different types of problems. These problems are as follows- The problem of identifying reproductively valuable women, the problem of securing certainty in paternity, the problem of identifying women with good parenting skills and those who are willing, able to commit to a long term mating relationship. These problems are summarized in table 3.3.

Historically, women have been inhibited in their reproductive success, but it is not by the number of men they can have sexual access to. Rather it is mainly by the quality and quantity of the external resources that they can assure for themselves and their offsprings and secondarily by the quality of man's genes. These reproductive constraints can be divided into two different problems. Historically, women had to solve these two problems to effectively pursue a short term mating strategy. These problems are as follows- the problem of immediate resource extraction and the problem of assessing prospective long term mates. To effectively pursue a long term mating strategy, women historically had to solve different adaptive problems. They are as follows- the problem of identifying men who have the capacity and show willingness to invest resources in her and her offspring for long term, the problem of identifying men with good parenting skills, the problem of identifying men who are willing and able to commit to a long term relationship with her, the problem of identifying men who are able and willing to protect them from aggressive individuals from the same species. These problems are summarized in table 3.4.

Men and women have evolved different psychological mechanisms, These function to solve the adaptive problems, in order to effectively pursue short and long term matings. These psychological mechanisms and their behavioral manifestations when combined with the temporal contexts, form the evolved sexual stratgies of men and women. Sexual strategies theory creates more detailed, precise and numerous predictions than previously given theories of human mating about adaptive problems that are confronted by men and women in different mating contexts. In our next unit, we will look at Women's long-term mating strategies, men's long-term mating strategies and Short-term sexual strategies across sexes in detail.

Table 3.3: Mate selection problems faced by men

Types of mating	Mate selection problems faced by men
Short term mating	1. Problem of partner number 2. Problem of identifying which women are sexually accessible

	3. Problem of identifying which women are fertile 4. Problem of minimizing cost, risk and commitment
Long term mating	1. Problem of identifying reproductively valuable women 2. Problem of securing certainty in paternity 3. Problem of identifying women with good parenting skills 4. Problem of identifying women who are willing, able to commit to a long term mating relationship.

Table 3.4: Mate selection problems faced by women

Types of mating	Mate selection problems faced by women
Short term mating	1. Problem of immediate resource extraction 2. Problem of assessing prospective long term mates
Long term mating	1. Problem of identifying men who have the capacity and show willingness to invest resources in her and her offspring for long term 2. Problem of identifying men with good parenting skills 3. Problem of identifying men who are willing and able to commit to a long term relationship with her 4. Problem of identifying men who are able and willing to protect them from aggressive individuals from the same species.

3.4 SUMMARY

Survival for our ancestors was not an easy task. They encountered many problems during the process. These are called as probl;ems of survival. We know that food is our basic need and we cannot live without food. Our ancestors faced many problems to satisfy this basic need. They needed to choose what foods can be safe for them and how they can get an adequate number of calories from the consumption of food. Humans have different types of adaptations such as neophobia- strong aversion to new foods, pregnancy sickness, emotion of disgust etc. Alcoholism in today's world is likely a maladaptive consequence of the overindulgence of frugivorous adaptations. We also talked about how our ancestors consumed meat by hunting animals and the socio-cultural aspect of food. We also looked at antimicrobial hypothesis and cooking hypothesis in detail.

We saw how fear and anxiety help us to survive. There are six defenses such as freezing, fleeing, fighting, submission or appeasement, fright and fainting which generally take place in a predictable sequence. There are

some common fears like fear of height, snakes, spiders, strangers etc and they might have evolved for some hypothesized adaptive problems. Sex differences are also seen in fear. Thousands of years ago, humans needed to choose a place to live and they had preferences for the same. They preferred places with resources who are needed to live and avoided places where there was risk to their survival. The three stages of habitat selection are selection, information gathering and exploitation. We also looked at the Savanna hypothesis in detail.

With the help of Trivers theory (1972) of parental investment and sexual selection, we learned how humans might choose their mate. Various studies helped us to understand how women's choice of mate may change, depending on the period of their menstrual cycle. Sexual strategies theory given by Buss ands Schmitt (1993) explained about long term and short term sexual strategies by men and women and adaptive problems both the sexes needed to deal with. These problems are different for both the sexes but still there are some adaptive problems which are common in both, like identifying a mate with good parenting skills. We are going to look at long term and short term strategies in detail in our next unit. Men and women have evolved different psychological mechanisms, which function to solve these adaptive problems, in order to effectively pursue short and long term matings.

3.5 QUESTIONS

A) Write long answers:

a) Discuss in detail about food acquisition.

b) Explain in detail about human fears.

c) Discuss in detail about landscape preferences.

d) Write about mate selection in detail.

e) Explain in detail about sexual strategies.

B) Write short notes:

a) Mate selection problems faced by men and women.

b) Six defenses given by Marks and Bracha.

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4

MAJOR ASPECTS OF EVOLUTIONARY THEORY: SURVIVAL AND MATING- II

Unit Structure

4.0 OBJECTIVES

After studying this unit you should be able to:

- Understand long term mating strategies of women
- Know men's long term mating strategies
- Study the context effects on men's and women's mating preferences
- Study how men's and women's mate preferences affect actual mating behavior
- Understand short term sexual strategies of men and women

4.1. WOMEN'S LONG TERM MATING STRATEGIES

In our last unit, we understood the concept of mate selection and sexual strategies. In the next section, we will look at women's long term mating strategies in detail.

4.1.1 The Content of Women's Mate Preferences

Preference for Economic Resources :

Females prefer males who can offer them resources, from ancient times. The evolution of this preference is a prevalent basis for female choice. A study was done by Yosef (1991) about gray shrike birds living in the Negev Desert of Israel. Just before breeding season, male shrikes begin collecting things like food and feathers, pieces of clothes etc. They impale these items on thorns etc. in their territory. Female shrikes then scan the available males and they then choose to mate with those with the largest collection of items. It was found that female shrikes totally avoided males without resources.

In case of humans, this evolution of female's preference for a long term mate with resources would have required two prerequisites- 1) resources would have to be incremental , defensible, and controllable by males during human evolutionary history.2) Men would have to differ from each other in their possessions and their willingness to invest such possessions in a woman and her children. In human evolutionary history, most women could gather better resources for their offsprings from a single spouse than from many temporary sex partners. Men provide for their wives and offsprings to a large extent, as compared to other primates. In other primates, males generally do not share their food with their mates, so females need to acquire their food on their own (Smuts, 1995).But in humans, men supply food, find shelter, defend their territory, etc. They protect and tutor their children, transfer their status which helps the child in forming reciprocal alliances in future. It is very unlikely for a women to get these benefits from a temporary sex partner. This stimulated the evolution of women's preferences for men with resources. But in order to know a man's possession of needed resources, women need some cues. We will look at them in detail-

Preference for good financial prospects:

Many studies show that modern U.S. women value economic resources in mates significantly more than men do. A large cross cultural study was done with 10,047 individuals of thirty-seven cultures on six continents and five islands (Buss et al., 1990). Results revealed that women from all continents, all political systems, all racial and religious groups, and all systems of mating gave more value than men on good financial prospects. Women value financial resources about twice as much as men. Women across the world wished for financial resources in marriage partners more than men. These results showed extensive cross-cultural evidence which supports the evolutionary basis for the psychology of human mating. Even in Hadza of Tanzania, which is a hunter gatherer society, it was seen that women give more importance to man's foraging abilities—mainly his ability to hunt and provide meat (Marlowe, 2004). This sex difference is also see in modern forms of dating such as speed dating and mail-order brides. A study of the mate preferences of mail-order brides from Colombia, the Philippines, and Russia was done. It showed that these

women looked for husbands who had status and ambition- which are two main correlates of resource acquisition (Minervini & McAndrew, 2006). Women also place significant value on intelligence in long term mates (Buss et al., 1990; Prokosch, Coss, Scheib, & Blozis, 2009) as it is a quality which highly predicts income and occupational status (Buss, 1994b). All these researches done with different people, different methods, in different time periods support the hypothesis that women have evolved a powerful preference for long-term mates with the ability to provide resources.

Preference for High Social Status :

Among various cultures , like Melanesians, the early Egyptians, Sumerians, the Japanese, and the Indonesians there were people called "head men" and "big men" . They enjoyed power and recourse privileges of prestige. The term big man is found in Sanskrit, Hindi and many Dravidian languages. Women show willingness for men who have a high position as social status indicates the control of resources. Higher status is associated with better food territory and health care. Greater social status gives such children social opportunities which are missed by the children of lower-ranking males. U.S. women give more importance to education and professional degrees in mates. These characteristics are strongly linked with social status.

Preference for Somewhat Older Men :

In the animal kingdom, young male baboons must mature before they are good to enter the upper ranks in their social hierarchy. Human adolescents generally don't have the respect, status, or position of more mature men. For example, in all thirty-seven cultures included in the international study on mate selection, results revealed that women preferred older men. On average in all cultures, women prefer men who are around three-and-a-half years older. But the question arises that why do women prefer somewhat older men but not much older men. The answer may lie in the problems developing in much older men. Much older men are more likely to be infertile, females getting pregnant with them are more likely to experience pregnancy problems and their children are at increased risk of genetic abnormalities (Spinelli, Hattori, & Sousa, 2010). Things that change with age shall also be considered to understand why women value somewhat older mates. Access to resources is one of the most consistent changes. In current societies, income tends to increase with age (Jencks, 1979). In traditional societies also, part of this linkage can be related to physical strength and hunting skills as physical strength increases in men as they get older. Thus women's preference for somewhat older men may come from our hunter gatherer ancestors.

Preference for Ambition and Industriousness :

Hard work is one of the best predictions of past and anticipated income and promotions. People who say they work hard and their spouses agree that they work hard get greater levels of education, status, and higher annual salaries, and anticipate greater salaries and promotions as

compared to those who failed to work hard. As compared to lazy, unmotivated men, industrious and ambitious men secure a higher occupational status (Jencks, 1979; Kyl-Heku & Buss, 1996; Lund, Tamnes, Moestue, Buss, & Vollrath, 2007; Willerman, 1979). In the majority of cultures women give importance to ambition and industry more than men do. Evidence from cross-cultural and cross-historical studies supports the main evolutionary expectation that women have evolved a preference for men having signs of the ability to obtain resources and contempt for men who lack ambition leading to resources.

Preference for Dependability and Stability:

In the worldwide study on mate selection it was found that dependable character and emotional stability or maturity are the second and third most highly valued characteristics. These characteristics are valued by women worldwide for two reasons. First reason is that they are reliable signals that over time, resources will be provided consistently. Second reason is that men who don't have dependability and emotional stability give in an odd way and impose heavy emotional and other costs on their mates (Buss, 1991). They are likely to be self-centered, possessive and show higher-than-average sexual jealousy. They tend to be verbally and physically abusive, display inconsiderateness (Buss & Shackelford, 1997a). All these results indicate that these men will fail to channel resources consistently over time. Women give importance to dependability and emotional stability to get the benefits that a mate can supply them consistently over time.

Preference for Height and Athletic Prowess:

Women may experience physical domination from larger, stronger males, which can lead to injury, sexual domination. These situations surely occured somehow regularly with our ancestors. Studies of non-human primates showed that males have physically and sexually dominated females. One advantage of long term mating for women is the physical protection a man can offer. Cues that indicate the solutions to the problem of protection are man's size, strength, physical and athletic ability. Short men are judged as undesirable by women for short term or long term mating (Buss & Schmitt, 1993). In contrast, tall, physically strong and athletic partners are found very desirable by women (Hughes & Gallup, 2003). The problem of protection from other aggressive men is solved by women by preferring a mate who has the size, strength, and physical capability to protect them. These physical qualities are also solutions to other adaptive problems like obtaining resources and genes for good health,as tallness is linked with status, income, symmetrical features, and good health (Brewer & Riley, 2009).

Preference for Good Health: Symmetry and Masculinity :

Mating with an unhealthy person would have posed adaptive risks for our ancestors. An unhealthy mate would have a higher risk of becoming impaired, resulting in failure to provide food protection, health care, and investment in child rearing etc. There can be risks of premature death and

transfer of communicable diseases by the unhealthy mate. An unhealthy mate might infect the children and there can be risk of passing on genes for poor health to children. Facial and body symmetry is an important health cue reflecting one's ability to withstand environmental and genetic stressors. Thus females are hypothesized to have evolved a preference for males who have physical evidence of symmetry. It may have genetic benefits as well. Facially symmetrical individuals get high scores on tests of physiological, psychological, and emotional health (Shackelford & Larsen, 1997). Another health cue might come from masculine features. Men are likely to have longer, border lower jaws, stronger brow ridges, prominent cheekbones as a result of hormones such as testosterone. In a study, results revealed that women generally preferred faces that were more masculine-looking than average (Johnston, Hagel, Franklin, Fink, & Grammer, 2001). Vocal masculinity is found to be attractive by women (Feinberg, DeBruine, Jones, Little, 2008). According to Johnston, masculine features are signals of good health. High levels of testosterone compromise immunity. Only healthy males can produce high levels of testosterone and less healthy males must suppress their testosterone production .Thus healthy males produce more testosterone. If this argument is correct then women's preference for masculine faces is a preference for a healthy male. We can summarize from the evidence that women give importance to health in mate selection.

Love and Commitment :

Women have faced the adaptive problem of choosing men who show willingness to commit the resources to them and their children. Resources can be observed directly but commitment cannot. Thus to test one's commitment, looking for cues that indicate future channeling of resources is required. One of the main cues to commitment can be love. Acts of commitment are most central to love according to men and women. These acts are giving up romantic relationships with others, the decision of marriage, and showing a desire to have children with this person. When these acts of love are performed by a man, they show his intention to commit resources to one woman and her future children. Fidelity is one component of commitment. It is remaining faithful to a partner when not physically together. It is commitment of sexual resources to a single partner. Emotional support is another facet of commitment. These acts are seen as essential to love and they indicate the commitment of genetic, economic, emotional and sexual resources to one person. Thus it is predicted that women give importance to love while choosing long-term mates.

Preference for Willingness to Invest in Children:

Measuring men's willingness to invest in children is an adaptive problem that women face when selecting a long-term mate. Its important as men sometimes look for sexual variety and they may divert their efforts toward other women. Another reason is that men evaluate if they are the actual genetic father of the child and are likely to withhold investment if they know or suspect that the child is not their own (La Cerra, 1994). A study

done by La Cerra (1994) suggests that women prefer men who show a willingness to invest in children as marriage partners. They have a certain preference and attraction for men who show a willingness to invest in children.

Preference for similarity:

Both women and men show strong preferences for mates who have similar values, worldviews,political orientations, and intellectual level. Individuals who are similar on above mentioned characteristics date (Wilson, Cousins, & Fink, 2006) and get married (Buss, 1985) much more often than those who are dissimilar. This phenomenon is known as homogamy. Similarity has benefits like emotional bonding, cooperation, communication, mating happiness. It leads to lower risk of breaking up, and probably increased survival of children (Buss, 2003; Castro, Hattori, & Lopes, 2012).

Additional Mate Preferences: Kindness, Humor, Incest Avoidance, and Voice :

In long term mates, traits of kindness, altruism, and generosity are highly valued by women (Barclay, 2010; Phillips, Barnard, Ferguson, & Reader, 2008). Women prefer men who have a good sense of humor as long term mates (Buss & Barnes, 1986; Miller, 2000). Incest avoidance is one of the main preferences. Reproducing with genetic relatives is known to create "inbreeding depression,". It can lead to having a child with more health problems, lower intelligence because of the expression of deleterious recessive genes. Human beings have strong incest-avoidance mechanisms. for example, emotion of disgust at the thought of having sex with a sibling (Fessler & Navarrete, 2004; Lieberman, Tooby, & Cosmides, 2003). Many studies support the hypothesis that women find a deep voice specifically attractive in a potential mate (Evans, Neave, & Wakelin, 2006; Feinberg et al., 2005b; Puts, 2005). Reasons for ethe same could be that deep voice signals sexual maturity, larger body size, good genetic quality, dominance or all of the above.

4.1.2 Context Effects on Women's Mate preferences:

We saw many preferences that women have about long term mates. They are not predicted to operate blindly. In fact, women's mate preferences are context dependent. Let us understand the same in detail.

Effects of Women's Personal Resources on Mate Preferences:

According to the structural powerlessness hypothesis, women are generally excluded from power and access to resources, which are largely controlled by men. Therefore women seek mates who have power, status, and earning capacity. They try to get married in higher socioeconomic status because it gives them access to resources. Men do not give importance to economic resources in a mate as much as women. It is because they already have control over these resources (Buss & Barnes, 1986; Eagly & Wood, 1999). But it is seen that though women in the U.S.

are professionally and economically successful, they value resources in men. It was also seen that women who were financially successful, showed a stronger preference for high-earning men as compared to women who are less financially successful. This is contrary to the structural powerlessness hypothesis. (Buss,1989a). Evidence found that these results failed to support the structural powerlessness hypothesis, but they directly contradict it.

The Mere Presence of Attractive Others- Mate Copying:

When an individual's choice of potential mate is affected by the preference or mating decisions of others. It's called mate copying. This phenomenon is previously documented in species like birds and fish (Dugatkin, 2000; Hill & Ryan, 2006). Now it's seen in humans as well. Two studies revealed that when a man was surrounded by women, he was judged to be more attractive as compared to when he was standing alone (Dunn & Doria, 2010; Hill & Buss, 2008a).

Effects of Temporal Context on Women's Mate Preference:

A mating relationship can last for longer or shorter duration. Findings by Buss and Schmitt (1993) suggest that temporal context matters a great deal for women. It leads to shifts in their preferences, depending on whether a marriage partner or a casual sex partner is searched for (Schmitt & Buss, 1996). A study revealed that women highly valued warmth and trustworthiness in a long-term mate, but to a lesser degree in a short-term mate (Li and Kenrick, 2006).

Effects of Women's Mate Value on Mate Preferences:

A woman's mate value is her overall desirability to men. A female's physical attractiveness and youth signal her mate value. As a result, women who are more physically attractive and young have more mating options and they can be choosy in their selection. These women specified a longer list of traits they searched for in a potential mate than women who were lower in mate value (Pawlowski & Dunbar, 1999a; Waynforth & Dunbar, 1995). Women who were attractive showed a desire for higher levels of masculinity, physical attractiveness, sex appeal, and physical fitness. These studies concluded that women who are themselves higher in mate value, show preference and seek men who are higher in mate value.

4.1.3 How Women's Mate Preferences Affect Actual Mating Behavior:

Though we prefer something, it does not mean that we always get what we prefer. In this case, there are a limited number of highly desirable potential mates. An individual's own mate value limits access to highly desirable mates. For example, only highly desirable women are in position to attract highly desirable men and vice versa. Sometimes parents and others influence mating decisions regardless of personal preference. But still, women's mate preferences must have influenced their actual mating

decisions, or they would not have evolved. Many sources of evidence indicate that preferences in reality do influence mating decisions.

Women's Responses to Men's Personal Ads:

Evidence is found from women's responses to personal ads posted by men in newspapers. Men with higher levels of education, men who were somewhat older, and men who offered more resources received greater responses from women than did men who lacked these qualities.

Women's Marriages to Men High in Occupational Status:

A study U.S.in the year 1910 revealed that the higher a man's socioeconomic status, the greater the possibility that he would actually marry (Pollet & Nettle, 2007). Poor men were more likely to stay bachelors, unable to attract women, maybe because they failed to fulfill women's desire for men with resources and status.

Women marriages to men who are older:

Women's preferences for older husbands are reflected into actual marriages to older men. Actual mating decisions of women go hand in hand with their expressed preferences.

Effects of women's preferences on men's behavior :

Men are more likely than women to show off their resources , talk about their successes, display money and brag about their achievements (Buss, 1988b; Schmitt & Buss, 1996). When men try to devalue their competitors, they use tactics. They suggest that the rival is poor, lacks ambitions and is not likely to be professionally successful (Buss & Dedden, 1990; Schmitt & Buss, 1996). The emotion of envy is more experienced by men than women in response to mating rivals who have better status and resources (DelPriore, Hill, & Buss, 2012). Research indicates that men are aware about women's preferences for resources, they take actions to express what women want. A part of men's behavior can be predicted from women's preferences. It can be concluded from the studies above that women's mate preferences have an important impact on their own mating behavior and also on the mating strategies of men. We will have a look at men's long term mating strategies in detail in the next section.

4.2 MENS LONG TERM MATING STRATEGIES

4.2.1 Theoretical Background for the Evolution of Men's Mate Preferences:

In this section, we will talk about the following topics- why men would marry and benefits of commitment and marriage. Another topic is complexities related to the content of men's desires, and how selection might have caused specific mate preferences in men.

Why Men Might Benefit from Commitment and Marriage:

We know that many ancestral women needed reliable cues of male commitment before consenting to sex,. Males who failed to commit might have failed to attract any women at all. Another advantage of marriage is an increase in the quality of the woman a male would be able to attract. Men who are willing to provide long-term resources, protection, and investment in offspring are appealing to women. Thus men who are willing to commit to the long term relationship have a greater range of women to choose from. A third benefit is an increase in the chances that the male is the father of the children a woman has. Males gain repeated and generally exclusive sexual access through marriage. Without this exclusive, repeated access, a man's certainty in paternity would be endangered. A fourth advantage would have been an increase in the survival of man's offspring. In human evolutionary history, children who survive without fathers' investment might have suffered from the lack of fathers teaching, and political alliances as both these things help to solve problems in future. Another potential benefit is that increased reproductive success of children accrued through paternal investment. Men also get advantage from marriage by an increase in status. Males are not thought of to have achieved true manhood until they have married in many cultures. Men also get access to coalitional allies through his wife's family.

The Problem of Assessing a Woman's Fertility or Reproductive Value:

Ancestral men had to marry fertile women with the capacity to bear children in order to be reproductively successful. A woman with the ability to bear more children would have been better than women to be reproductively successful. Men cannot directly observe women's reproductive value. Selection of women as mates could only have fashioned preferences for qualities which are observable, and which reliably correlate with reproductive value. How do men determine women's reproductive value or fertility?

Reproductive value is the number of children an individual of a given age and sex is likely to have in the future. A woman who is fifteen years old has a higher reproductive value than a woman who is thirty years old. This is because the younger woman is likely to have more children in the future than the older woman. But a fifteen year old might decide to not have children in future and a thirty year old may have six. The main thing is that reproductive value is the average expected future reproduction of an individual of a given age and sex. Reproductive value is different from fertility. Fertility is defined as actual reproductive performance, which is measured by the number of viable children produced. In human populations, fertility reaches a peak in the mid-twenties. The solution to the problem of detecting fertility or reproductive value, is complex. The number of children women are likely to have is not encoded in her social reputation, and women may themselves lack direct knowledge of their reproductive value. But ancestral men could have evolved adaptations which are sensitive to the observable qualities of a woman which were

correlated with underlying reproductive value. Two observable cues are women's youth and her health (Symons, 1979; Williams, 1975). Old, unhealthy women certainly could not reproduce as much as young, healthy women can do. But which observable qualities of a woman might signal youth and health? We will try finding answers to this question in the next section.

4.2.2 The Content of Men's Mate Preferences:

Like women, men show a desire for an intelligent, kind, understanding and healthy partner (Buss, 2003). They also look for partners who share their values and have similar attitudes, personality, and religious beliefs. But ancestral men faced different types of adaptive mating problems than did ancestral women, so today's men are predicted to have a different set of mate preferences as adaptive solutions. One of the most powerful cues to women's reproductive status is her age.

Preference for Youth:

Youth is an important cue as a woman's reproductive value decreases slowly as she moves past age twenty. By the age of forty, her reproductive capacity is low and by fifty it's zero. This preference of men for youthful partners is not limited to western world. This is seen in the case of Nigerian, Indonesian, Iranian, and Indian men. That is, men universally prefer younger women as wives. The strength of these preferences vary from culture to culture.

Among Scandinavian countries men prefer their wives to be only one or two years younger but men in Nigeria, Zambia prefer their wives to be six and a half and seven and a half years younger, respectively. A study about personal ads in newspapers revealed that a man's age has a strong effect on what he desires. As men's age increases, they prefer women who are increasingly younger than they are. Men in their thirties prefer women who are roughly five years younger, where men in their fifties prefer women who are ten to twenty years younger (Kenrick & Keefe, 1992).

According to an evolutionary model, men do not desire youth but rather features of women that are related to her reproductive value or fertility. According to this perspective, when it comes to the age preferences of adolescent males, teenage males shall prefer women who are slightly older than them. It is contrary to the generally observed pattern of men desiring younger partners. This is because in the case of adolescents, slightly older women have higher fertility than women of their own age or women who are younger (Kenrick, Keefe, Gabrielidis, & Cornelius, 1996).

Teenage males at their youngest ages prefer women who are a few years older than themselves. But as their age increases, men prefer women who are increasingly younger than them. One explanation of men's desire for younger women is that they are easy to control and are less dominant than older women and men search for women who they can control. But this explanation seems incorrect as teenage males do not prefer young women.

Another explanation is learning theory. As women are likely to prefer men who are somewhat older, men may have received more reinforcement for seeking dates with younger women. But this explanation also fails to explain the preferences of teenage males. They prefer older women despite the fact that the interest is rarely reciprocated. Evolutionary psychological explanation has received strong support from the cross cultural data. Men wish for younger women as over evolutionary time, youth has regularly been linked with fertility. This theory explains two facts that other theories don't focus on. The first one is that men desire increasingly younger women as they themselves get older and second one is that teenage males prefer women a few years older than they are, despite the fact that such females don't often reward them for this interest.

But one thing is not explained by the evolutionary hypothesis. Men who are fifty prefer women who are in their mid-thirties i.e. the actual age preferences of older men are beyond maximum fertility. There are some possible explanations. First, it may be difficult for older men to actually attract dramatically younger women, and their preferences may reflect a compromise among their ideals and what they can get (Buunk et al., 2001). Second, large age differences may lead to less compatibility, more marital conflict, and greater marital instability. Third, modern marriage is likely different from ancestral marriage. In today's marriages, couples spend a lot of time together, they socialize as a couple, and act as companions. In hunter gatherer groups, ancestral marriages were more likely to have divisions of labor, and women spent most of the time children and other women, and men spent their time hunting and socializing with other men. Therefore, similarity and compatibility are important in the functioning of modern marriages. This may have created a change in men's age preferences above the point of maximum female fertility.

Evolved Standards of Physical Beauty:

Our beauty standards for females have cues to women's fertility or reproductive value. According to evolutionary perspective, beauty is in the "adaptations' ' of the beholder (Symons, 1995). For our ancestors, observable evidence of a woman's reproductive value were as follows- (1) features of physical appearance, like full lips, clear and smooth skin, clear eyes, shiny hair, body fat distribution and good muscle tone ; (2) features of behavior, like bouncy youthful gait, high level of energy and an animated facial expression. These are physical cues to youth, health and thus also to fertility and reproductive value. Therefore they have been hypothesized to be few main aspects of male standards of female beauty (Symons, 1979, 1995).

Many universal cues that correspond with the evolutionary theory of beauty are discovered by Ford and Beach (1951). Signs of youth (clear, smooth skin) and signs of health (absence of sores and lesions) are universally considered attractive. Cues to ill health, older age, poor complexion are considered as unattractive or less attractive.

There are some universally undesirable cues like Ringworm, facial disfigurement, and filthiness. The white of eyes around the iris- a super white sclera is the main cue to health and it is considered as attractive (Provine, Cabrera, & Nave-Blodgett, 2013). Length and quality of women's hair is cue to youth and health. A study revealed that hair length and quality were strong cues to youth. Women who were young had high quality, longer hair than older women (Hinsz, Matz, & Patience, 2001). Another important element in judgment of attractiveness is skin quality. It gives a cue to a woman's age and some information about her lifetime health (Sugiyama, 2005). Clear and unblemished skin indicates an absence of parasites and skin-damaging diseases during development, and probably good genes that can deal with disease and heal without infection (Singh & Bronstad, 1997).

Femininity is also a cue to attractiveness (Gangestad & Scheyd, 2005) and a meta-analysis showed that facial femininity is one of the strongest cues to women's attractiveness (Rhodes, 2006). Facial femininity involves cues like large eyes, thinner jaws, small chin, high cheekbones, and full lips etc. This female facial femininity seems to indicate reproductive value for the following reasons. First, as a woman's age increases, her facial features become less feminine. Also, facial femininity is related to higher levels of estrogen, the hormone in females that correlates with fertility (Schaefer et al., 2006). Another reason is that facial femininity is related to health and certain parts of disease resistance (Gray & Boothroyd, 2012). Even feminine voices are found to be more attractive in women, providing cues to youth (Collins & Missing, 2003; Feinberg et al., 2005a; Röder, Fink, & Jones, 2013). Another correlate of female attractiveness is facial symmetry (Gangestad & Scheyd, 2005; Rhodes, 2006) and symmetrical faces are considered as healthier than less symmetrical faces (Fink et al., 2006). Facial averageness is another quality linked with attractiveness. Long legs are hypothesized to be a cue to biomechanical efficiency and health (Sorokowski & Pawlowski, 2008).

Traditional theories of attraction have the assumption that standards of attractiveness are learned by an individual gradually through cultural transmission. Thus they do not emerge fully until an individual is three or four years old (Berscheid & Walster, 1974; Langlois et al., 1987). But the evidence by Langlois, Roggman, & Reiser-Danner (1990) challenged this view. According to their study no training seems required for these standards to emerge .Elements of beauty are not arbitrary or culture bound. A study showed huge consensus about who is and who is not considered as good-looking (Cunningham, Roberts, Wu, Barbee, & Druen, 1995).

Using neuroscience technology, it was found that the reward circuit-pleasure center in the brain fails to become activated when men look at male faces or typical female faces. But it is especially activated when they look at attractive female faces. Thus beautiful female faces are psychologically and neurologically rewarding for the men.

Body Fat, Waist-to-Hip Ratio, and Body Mass Index:

Apart from facial beauty, features of the rest of the body provide cues to a woman's reproductive capacity. Standards for female bodily attractiveness can vary from culture to culture. One such culturally variable standard is the preference for slim versus a plump body build. In cultures where there is scarcity of food, plumpness indicates wealth, health, and sufficient nutrition during development (Rosenblatt, 1974).

During economic hard times, men prefer heavier women (Pettijohn & Jungeberg, 2004). In cultures where abundant food is available, the wealthy distinguish themselves by being thin (Symons, 1979). Though the body weight preferences differ in cultures they are predictable, suggesting context-dependent adaptations (Sugiyama, 2005, p. 318).

One preference for body shape that might be universal is the preference for a particular ratio between the size of a woman's waist and her hips (Singh, 1993; Singh & Young, 1995). The waist-to-hip ratio (WHR) is similar for boys and girls before puberty. A dramatic change occurs in boys and girls fat distributions at puberty. Boys lose fat from their buttocks and thighs, but in girls, due to the release of estrogen, fat is deposited on their hips and upper thighs. Thus after puberty, WHR in women becomes significantly lower than men's. Reproductively capable and healthy women have WHR between .67 and .80, and healthy men have WHR between .85 to .95.

WHR is a good indicator of the reproductive status of a woman . Women who have lower ratios display earlier pubertal endocrine activity. Married women with higher WHR have more difficulty getting pregnant. Similarly, The WHR is also an accurate indicator of long-term health status. Stroke, diabetes, hypertension, heart attack, and gallbladder disorders are linked with the distribution of fat rather than the total level of fat. Singh also found that WHR is a significant part of women's attractiveness. In many studies conducted by him, it was revealed that men found women's average figure more attractive than a thin or a fat figure. There are differences in preferences for WHR based on long term and short term sexual strategies. Men who are likely to pursue a short-term sexual strategy have a greater preference for low WHR than men following a long-term mating strategy (Schmalt, 2006). Body mass index (BMI) is another hypothesized cue to female body attractiveness. It is calculated from an individual's weight and height. BMI and WHR are positively correlated i.e. as WHR increases, BMI increases. Some Sex differences are found in the importance given to physical appearance by men and women. It was seen that men considered physical attractiveness and good looks as more important as compared to women.

Do Men Have a Preference for Ovulating Women?

Ovulation is the time when the egg, released into the woman's uterus to be potentially fertilized by a sperm. Most nonhuman primate species exhibit attraction to ovulating females (Puts et al., 2013). But in humans, the process of ovulation is cryptic. Some studies suggest that men might be

able to detect ovulating women (Symons, 1995). For example, women's skin may glow , slightly lighten (Frost, 2011; van den Berghe & Frost, 1986), their voices may rise in pitch (Bryant & Haselton, 2009) during ovulation. Studies also revealed that during ovulation, men perceive their romantic partners to be more attractive (Cobey et al., 2013) and ovulating women are touched more frequently in singles bars by men (Grammer, 1996). So we can conclude that there are some observable physical changes in a women's body when they ovulate—changes which are known to be sexually attractive to men.

Ancestral men faced a unique paternity problem which was not faced by other primate males, i.e. how to be sure of their paternity when ovulation was concealed. Marriage potentially gave one solution (Alexander & Noonan, 1979; Strassman, 1981). Following two mate preferences could solve the problem for males- first one is desire for premarital chastity and second one is the pursuit for postmarital sexual fidelity.

4.2.3 Context Effects on Men's Mating Behavior:

Mens long term mating strategies are influenced by social, ecological, and personal contexts. Most men give importance to youth and beauty, but not all men are successful in achieving their desires. Some men lack the status and resources that women want. They may face problems in attracting such women and may have to settle for less than their ideal. Men who have higher occupational status tend to marry women who are more physically attractive as compared to men low in occupational status. Such men who have high status and income are aware about their ability to attract more desirable women.

Contrast Effects from Viewing Attractive Models:

Many standards of beauty are not arbitrary but they incorporate cues to fertility and reproductive value. Advertisers use existing mate preferences in order to be successful. They put a clear skinned and young woman with regular features in a car advertisement because that exploits men's evolved psychological mechanisms and it leads to sale of the car. But such media images have a negative impact. A study revealed that men viewing pictures of attractive women eventually rated their actual partners to be less attractive as compared to men who had seen pictures of women who were average in attractiveness (Kenrick, Neuberg, Zierk, & Krones, 1994).

Testosterone and Men's Mating Strategies:

The hormone called testosterone (T) plays a main role in male mating efforts– the time and energy spent to pursue mates and besting same-sex competitors (Ellison, 2001). Higher testosterone levels in males facilitate male pursuit of females. These levels also increase after interaction with an attractive woman (Roney, Mahler, & Maestripieri, 2003). But maintaining high levels of testosterone can be high priced for men as it can compromise immune functioning. Having a committed mating relationship causes a reduction in testosterone in men but it is only when their orientation is monogamous and they do not desire extra-pair sex.

Men's mate preferences change as a result of their "mating budget." Men try to focus on necessities such as sufficient levels of physical attractiveness on a limited mating budget. After these "necessities" are fulfilled, they move to "luxuries" such as creativity and personality traits.

4.2.4 Effect of Men's Preferences on Actual Mating Behavior:

Men's mate preferences have an impact on actual mating behavior. Men respond more often to personal ads given women who claim to be young, physically attractive. This response of men to women's personal ads gives evidence that men act on their preferences. Men actually marry women who are younger to them by around three years. These actual marriage decisions by men confirm their preference for women who are increasingly younger than them. Such men who are married to younger women have higher reproductive success. Attracted women are visually attended more by men as compared to women who are less attractive. When men are interacting with attractive women, they lower their vocal pitch into a more masculine range which appeals to women. Attractive, young waitresses receive more tips from men (Lynn, 2009), and men spend more money on engagement rings for younger brides than on older brides-to-be. Women spend more effort than men to enhance their outer appearance to attract mates. These include wearing makeup, dieting, using cosmetic surgery, etc. which suggests that women are responding to men's preferences. Women tend to demean their rivals by putting down their physical appearance and calling them promiscuous. These tactics are effective in displaying their rivals as less attractive to men, as they don't follow the preferences which men have for a long term mate.

To summarize, women's behavior is likely to be predicted by the preferences expressed by men. So we can say that males' mate preferences affect actual mating behavior of their own as well as of women.

4.3 SHORT TERM SEXUAL STRATEGIES ACROSS SEXES

4.3.1 Theories of Men's Short Term Mating:

Men are predicted to have evolved a greater wish for casual sex than women. The reproductive benefit for men who successfully pursue short term mating is an increase in the number of offspring produced. But there are some potential costs of short term mating for men such as a risk of contracting sexually transmitted diseases, acquiring a social reputation as a "womanizer, (which would reduce their chances of finding a long term mate). There are other disadvantages like reduction in the survival chances of their children due to lack of paternal investment and protection; experiencing violence from the jealous husbands or boyfriends of the women if they were married or mated. There is also a risk of retaliatory affairs by their wives and the possibility of a costly divorce (Buss & Schmitt, 1993; Daly & Wilson, 1988; Freeman, 1983). Ancestral men who followed a short-term sexual strategy faced some adaptive problems. They are partner number or variety, sexual accessibility, identifying which

women were fertile, and avoiding commitment. We have also found some physiological, psychological and behavioral evidence for an evolved short-term mating.

4.3.2. Women's Short-Term Mating:

Testical size and differences in sperm insemination are some physiological clues in men, which suggest a long evolutionary history of sperm competition. In this competition, sperm from two men inhabit a woman's reproductive tract at the same time.

It seems unlikely that women would have frequently engaged in short-term mating without gaining some adaptive benefits. If they never engaged in short term mating,men could not have evolved a strong wish for sexual variety (Smith, 1984). If ancestral women willingly and frequently were involved in short-term mating, it would refuse the evolutionary logic if there were no advantages to women of doing so. In reality there are cues starting with the physiology of the female orgasm which suggest that ancestral women did engage in short-term mating.

The physiology of women's orgasm gives one important clue to an evolutionary history of short-term mating. Function of women's orgasm is to get the sperm from vagina into the the cervical canal and uterus, increasing the chances of conception. Women who have affairs are more likely to be orgasmic with their affair partner as compared to their regular partner (Buss, 2003). Results from some studies revealed that women are specifically likely to get sexual orgasm with masculine and physically attractive men. These are the qualities women generally desire in short-term mating (Puts, Welling, Burriss, & Dawood, 2012). The behavioral perspective suggests that women in most restrictive society sometimes involve in extramarital sexual unions. Modern cultural and tribal evidence does not suggest that women engage in monogamous long-term mating strategy all of the time.

Hypotheses about the Adaptive Benefits to Women pursuing Short-Term Mating:

There must have been some adaptive benefits associated with casual sex in some situations, so that short term sexual psychology evolved in women. There are five classes of benefits such as resources, genes, mate switching, short-term for long-term mating goals, and mate manipulation (Greiling & Buss, 2000). We will look at each of them in detail-

Resource hypotheses:

According to resource hypotheses, one advantage of short term mating is resource accrual (Symons, 1979). Women could get involved in short term mating for meat, services or goods. Smith (1984) gave the status enhancement hypothesis of short-term mating. According to this hypothesis, women may increase social status among her peers and get access to higher social circles because of mating with a high status man.

They can also get different tangible and intangible resources through short-term mating.

Genetic Benefit Hypotheses :

The benefits can be genetic as well. If a regular mate of a woman is infertile or impotent then a short term mate might give a fertility backup to help in conception. Genes of a short term mate might be superior than regular mate, specifically if she has an affair with a healthy, high status man, giving her child better chances for survival or reproduction (Smith, 1984). Having a child from a short term mate might give a women different genes than those of her regular mate, increasing the genetic diversity of her offsprings (Smith, 1984)

Mate Switching Hypotheses:

If a woman's husband stops providing her resources, starts abusing her, declining his value to her as a mate, (Betzig, 1989; Fisher, 1992; Smith, 1984) then the ancestral woman might have advantaged from short term mating. According to the mate expulsion hypothesis, engaging in a short term affair would help the woman to get away from her long term mate. Another form of this hypothesis suggests that a woman might also find a man who is better than her husband and may utilize a short-term encounter as a way of "trading up" to a higher quality mate.

Short-Term for Long-Term Goals Hypotheses:

According to this hypothesis, women use short-term mating as a way to assess and evaluate potential long-term mates (Buss & Schmitt, 1993). Involving into short term mating allows a woman to clarify the qualities she wants her long term mate to have , and also to judge her compatibility with a specific man (for example, sexual compatibility) and know any hidden costs he might have (for example, existing children).

Mate Manipulation Hypotheses:

According to this hypothesis, having an affair might enable women to get revenge on her husband for his infidelity, possibly discouraging him from future infidelity (Symons, 1979). A woman might be able to elevate the commitment of her regular mate if he sees with evidence that other men are seriously interested in her (Greiling & Buss, 2000).

Costs to Women of Short-Term Mating:

Women sometimes suffer more severe costs as a result of short term mating than men. Women have a risk of reducing their desirability as a long term mate if they get renowned for promiscuousness, because men value fidelity in potential wives.

Women having the reputation of being promiscuous suffer from reputational damage. According to Buss, (2013), woman suffer the damage ot their status and reputation as a result of short term sex, more than men. A woman engaging in exclusively short term sexual strategy is

at higher risk of physical and sexual abuse as she lacks a man to offer a long term protection. A woman who is not married risks getting pregnant in a search of causal sex and bearing children without the advantage of an investing man. Such children would likely have been at higher risk of diseases, injury and death in ancestral times. There are some women who -commit infanticide without the presence of an investing man. There is also a risk of contracting sexually transmitted diseses from short term mating. This risk is higher for women than men per act of sex (Symons, 1993).

4.3.3 Context Effects on Short-Term Mating:

There are individual Differences in Short-Term Mating. Results obtained from a study done by Greiling and Buss (2000) revealed that women who engage in short term mating have different perceptions of the advantages of the same as compared to women who tend not to pursue short-term mating. Findings supported many of the hypothesized benefits of extra-pair mating, such as obtaining resources, securing good genes and switching mates. Studies suggest that women engaging in a short-term mating strategy might not dress more provocatively in general. but when they are ovulating, they dress more provocatively. It was also found that men who are likely to pursue a short term mating strategy give more attention to physically attractive women than more long-term oriented men (Duncan et al., 2007)

There are some contexts which are likely to affect short term mating. Differences in sexual strategy depend on different types of social, cultural, and ecological conditions. Some such contexts affecting short term mating strategy are father absence and stepfather presence, transitions across life etc. One such context is sex ratio—a surplus of women are likely to promote short-term mating in both sexes. Another important context is mate value. Men who have higher mate value are more likely to pursue short-term mating. Some studies show that women with a low WHR (which is attractive) are a bit more inclined to pursue a short-term mating strategy. They are also perceived as more sexually unrestricted by others. Some personality characteristics also predict sexual strategy. Those who have high levels of extraversion, low levels of agreeableness and conscientiousness are more inclined to short-term mating. Those who have high scores on narcissism, psychopathy and Machiavellianism are likely to pursue an exploitative short-term mating strategy.

4.4 SUMMARY

In this unit, we learned that sexual strategies can be long term as well as short term. Initially, we looked at women's and men's long term mating strategies. We understood the content of mate preferences, how it is different for both the sexes and effects of context on mate preferences. We also discussed the effects of men's and women's preferences on their actual mating behavior. There are short term sexual strategies of men and women. We studied theories of men's short term mating and discussed five hypotheses about the adaptive advantages to women pursuing short term

mating strategy. Finally, we saw how context can have an important impact on short term mating.

4.5 QUESTIONS

A) Write long answers:

a) Summarize the content of women's mate preferences.

b) Discuss- evolved standards of physical beauty.

c) Explain- Women's short term mating.

B) Write short notes:

a) Explain- context effects on women's mate preferences

b) Discuss how women's mate preferences affect actual mating behavior,

c) Theoretical background for the evolution of men's mate preferences.

d) Write in detail- Men's preference for youth.

e) Context effects on men's mating behavior and effects of men's preferences on actual mating behavior.

f) Theories of men's short term mating and context effects on short term matings.

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5

PARENTING AND SOCIAL BEHAVIOR - I

Unit Structure

5.0 OBJECTIVES

After studying this chapter, the students will be able to:

- Understand evolutionary differences in maternal and paternal parenting behavior
- Understand evolutionary reason behind parent-offspring conflict
- Understand kinship theory and its empirical basi

5.1 PARENTING INTRODUCTION

According to evolutionary perspective, two of the primary jobs of any human being are survival and reproduction. We have developed several behaviors that aid in survival such as preference for certain types of food, bodily reflexes, heightened attention to negative stimuli, etc. The term survival in evolutionary psychology does not only refer to survival of the person themselves but also survival of their species. Best way to ensure survival of one's species is via reproduction. According to Buss(2011), off springs are primary vehicles carrying one's genes. As such, behaviors protecting one's children become paramount. Collectively, these behaviors can be called as parenting.

Parenting is an expensive task. Species that engage in parenting spend a lot of time and resources into raising their off spring. The resources that could have been spent on meeting more mates and producing more children. Humans carrying young ones also put themselves at risk as they cannot run immediately to save themselves, if a predator may attack. They also have to roam long and far to fetch food for their young ones, leaving the safety of their residence. This is the reason some species do not engage in parenting or show only minimal engagement for that matter, such as

oysters. Humans are one of the rare species providing extensive care to their babies. Several reasons contribute to this. First of all, humans cannot produce as many off springs at one attempt, in a life time, as much as oysters or cats or dogs do, for that matter. Second, human babies are born quite helpless. They need care for multiple years after being born to ensure their survival. For example, a calf stands on its feet few hours after being born. Whereas a human baby takes more than an year to start walking.

One of the puzzles that researchers studying humans tried to resolve for several years was the gender differences in parenting. All over the globe, across different species, mothers seem to be investing much more heavily in parenting than fathers. The reasons contributing to mating differences are where parenting difference is also stemming from. Since several years, traditionally mothers have been seen to be providing food and care whereas fathers have been providing resources and protection. In ancient societies, while fathers would go out hunting for meat, mother would stay back with young ones and look after them. An interesting study conducted recently found an pregnant women being involved in more 'nesting' behaviors such as organizing and de cluttering home(Anderson and Rutherford, 2013).

5.1.1 Maternal involvement and Paternal involvement:

The two leading hypothesis that explain difference in maternal and paternal care are:

1) Paternity uncertainty hypothesis

2) Mating opportunity cost hypothesis

Paternity uncertainty hypothesis:

Body structure of majority of the living beings is made such that females of the species bear gestation and give birth to offspring whereas males typically provide the seed / sperm for offspring conception via sex. Therefore, a female is often 100% sure that the baby born is carrying her genes. However for a male there is always a possibility that another male has provided sperm for the baby. The issue of whether baby is carrying one's genes or not is important here as the task of survival makes it necessary to ensure that one's own genes are continued to live in order for one's species to survive. Everyone, whether male or female want to spent their resources and care on their own child who is carrying their genes instead of protecting genes of someone else.

Paternity uncertainty issue becomes more salient in mammals like humans that involve internal fertilization. There is always a possibility that a female's egg is already fertilized when she comes in contact with male A, or she may secretly mate with any other male while courting male A. As such, it becomes quite costly for male A to provide their resources on a child he isn't sure is his own. As resources are limited, anything spent on a rival's child is snatching it away from one's own child. It is like helping another person to ensure survival of their genes instead of passing on

one's own genes. On the other hand, as mothers are always sure that the child born is carrying their genes, they bear no uncertainty cost when raising him/her. Thus, it is less profitable for fathers than mothers to spend all their time and resources on a child. This hypothesis explain why mothers are more heavily involved in childcare than father.

Mating opportunity cost hypothesis:

Mating opportunity costs are costs born as a result of spending time and resources taking care of a child. These costs are missed opportunities to produce another child due to being engaged with raising one child. Both the genders suffer this loss. Mothers bear this cost by gestating, breast feeding, looking after the baby whereas fathers pay it by being busy keeping away predators and fending for resources. As such neither of them can produce another child while completing these tasks.

Further these costs tend to be higher for males than females. This is because a human male has larger capacity to produce children than a human female. This is because a male's job in mating is to inseminate a female. Once it is done, he does not have any other physically engaging part to play in entire gestation. Thus, a male can produce as many child as the number of times he can inseminate a woman. This number can possibly be very large. However for a female, since once they get pregnant they cannot produce another child at least for next nine months, the number of children she can produce is limited. In other words, the lost mating opportunities as a result of being heavily involved in taking care of a child are more for a male than a female. This is why they do not spend 100% of their time and resources in raising a child.

This hypothesis is supported by study of a fish species by Gross and Sargent, 1985 (as cited in Buss, 2011). This fish species has a unique child rearing practice wherein male fishes mark and protect their own territory. A female fish lays her eggs in a territory she finds safe and thereafter it is male fish's job to protect the eggs and territory. Here, males do not suffer much mating cost and hence we see greater amount of paternal care. Rather, protecting one's eggs and territory well attracts other female fishes to lay their eggs on that territory thereby providing more opportunities for males to mate.

The mating opportunity cost hypothesis also lets us assume that in a society where more females than males exist, men have greater mating opportunity and hence will show poor participation in child rearing. However if a society has more males than females, mating opportunities will be less and hence males may show greater involvement (Pedersen 1991 as cited in Buss 2011). Some of the other factors that predict amount of paternal involvement apart from sex ratio in the society are attractiveness of a male as more attractive males have greater mating opportunities, population density since crowded places provide more mating opportunities than less dense areas, etc.

Thus, the paternity uncertainty hypothesis and mating opportunity cost hypothesis provide a compelling explanation for less paternal and more maternal involvement in child care.

5.1.2: Parent-offspring conflict:

As stated previously, children are primary means for parents to pass their genes and keep their species surviving. However, as human babies are born out of mating of a male and female, every child shares with each of their parent only 50% of genetic relatedness. This difference of 50% is what is responsible for the conflict between them. This genetic difference is also the reason behind difference between parents and children about allocation of resources wherein children want more resources for themselves than for their parents.

Daly and Wilson (1998, as cited in Buss 2011), explain this conflict with a simple example. Lets assume you have a brother and a sister. You mother comes home one day with three loafs of bread. Now, for her the idea allocation would be to give one bread loaf to each one of you. As she shares 50% of genetic related with each one of you, each one is an equal opportunity for her genes to survive. However for you, your siblings share only 50% of your genes while you are carrying 100% of your genes. More food means more survival and reproduction capacity. That is why you would want all the three bread loafs to come to you. This is where the difference in interest and conflict will begin between you and your mother.

To put the above example in generalized terms, the parent offspring conflict theory states that parents and children will experience disagreement primary based on resource allocation. Even in case of a single child, the child would want a larger share of family resources which would mean parents cannot spent it on their other reproductive pursuits. This conflict is expected to occur during all the life stages however it may become pronounced during adolescence as the child now tries to establish their independent identity and begin mating pursuits for which resources are needed.

Trivers (1974) indeed predicts these fights to occur instead of considering it just as a possibility. Accordingly human evolution has produced some adaptations in children that help them manipulate parents whereas parents have also developed some counter adaptations to deal with the same. According to Buss (2011), the theory predicts following hypothesis:

1. Parents would expect children to be weaned sooner than children wish to.

2. Parents would expect children to value their siblings more than children want to.

3. The fights between siblings and with parents will be punished by parents whereas agreement will be rewarded by parents.

Mother offspring conflict in utero:

As stated earlier, a mother is always 100% sure that the child belongs to her. Mothers are also found to be more heavily involved in parenting than fathers. As such it is surprising to know that evolutionary psychology predicts conflicts to take place even between mother and children.

This conflict begins from conception. The same logic of parent offspring conflict applies to mother fetus conflict. It will be more beneficial for a mother to invest in a child who is physically healthy enough to carry on her genes than a weaker one. Therefore, women's bodies have developed a mechanism that produces spontaneous abortions in the first few weeks of conception of the fetus has any genetic abnormalities. This saves mother from investing her efforts on a child who will die early and thereby not help in survival of her genes. It is found that 78% of eggs fail to fertilize or get naturally aborted in the first few weeks of pregnancy (Nesse and Williams, 1994; as cited in Buss 2011).

On the other hand, fetus has also developed some mechanisms to ensure its survival. Pregnant women often experience high blood pressure. Fetus receives nutrition via mothers blood. When this nutrition is low, fetus releases certain substances in mothers blood that make her arteries constrict and result in greater blood flow and thereby greater amount of nutrition to the fetus. Thus, the fetus clings to its life even at the cost of mother's health. This hypothesis is supported by the finding that women who experience high blood pressure during pregnancy have fewer rates of spontaneous abortions (Haig 1993; as cited in Buss 2011). Thus, this explanation is an extension of Triver's parent offspring conflict theory as here the fetus is trying to grab more of a mother's resources than her body is prepared to offer.

Mother Child conflict and sibling related:

Following from the above discussion, another reason for parent offspring conflict is presence of a sibling. While all the children are of equal value to mother, every child would be against the equal distribution of her resources and want majority of resources for themselves. In addition, presence of a step sibling is even more conflicting than presence of a real sibling as step siblings share only 25% of genetic relatedness.

Schlomer and colleagues (2010; as cited in Buss 2011) studied mother child relationship with the help of a 20 item questionnaire. The study found highest amount of mother child conflict in the presence of a younger step sibling, followed by younger full sibling and least with np sibling at all.

Parent offspring conflict over mating:

Mating is an important life event among human species. We have heard several stories of children choosing a partner against parent's wish. As an offspring finding a mating partner and consequently producing children matters to parents of the offspring as the grandchildren share 25% of

genetic relatedness with their grandparents. Selection of certain mating partners over others benefits not only the offspring but their parents as well. This is where the conflict enters. A person might be favorable mate for an offspring but not to their parents. For example, a son might select a female to be his partner who is physically healthy and thereby has capacity to produce healthy children for him. However son's father might want him to marry another girl who is higher in socio economic status, thereby providing an opportunity for father to move up the social ladder and increase his chances of reproduction and survival. Sometimes, offspring might only be interested in a short term mating however if parents are to spend their resources on offspring and their partner, it will be a costly deal for them. Consistent with this, studies have found off springs to prefer beauty when selecting mating partner whereas parents prioritize family background. This gives rise to parents trying to control their daughters behaviors and clothing, for example, in order to protect her from selecting wrong (according to parents) mating partner.These restrictions are stricter for daughters than for sons as females bear greater cost from wrong mating choices than males. They are heavily involved in child rearing and have lessor opportunities to produce a child than a male does. As such finding a good long term mate is more crucial for them.

Consequently, children also try to influence mating and re mating decision of their parents. Parental re mating means possibility of step siblings who prove to be strong competitors for parental resources. Therefore often children resist parental divorce as well.

5.2 KINSHIP INTRODUCTION

Several behaviors help humans accomplish task of survival. Mating, child raring and kinship are some of them. Birthing and taking care of one's child helps them pass on their genes as there is 50% of genetic relatedness between parents and children. We also share 25% of genetic relatedness with our grandparents, cousins, uncles, aunts, nieces, etc. Protecting and helping one's relatives is another way of passing genes and ensuring survival of species.

Like children, relatives are also vehicles of survival. However they differ in their value based on genetic relatedness. Selection has favoured adaptations that help in kinship behaviors. However the preference will always be given to one's own self followed by relatives in their degree of genetic relatedness. Selection has favored adaptations that promote helping close kin more than distant kin and help distant kin more than strangers. The characteristic of altruism has its origin in the principle of inclusive fitness.

5.2.1 Theory of implicit and inclusive fitness:

The famous quote by Darwin states well accepted truth of evolution, which is survival of fittest. The inclusive fitness is calculated by taking into account reproductive success of one's own self, plus that of one's

relatives as well, differing in weight based on their degree of relatedness. Let us understand this better with Hamilton's rule.

Hamilton's rule:

The acts of altruism are evolutionary riddle. Altruism is generally defied as acts that involve some self sacrifice that leads to benefit of another. Selection requires one to protect oneself and pass on one's own genes for the species to survive. As such altruism seems to contradict selection. Hamilton has helped solve this riddle by arguing that altruism will not prove to be costly if benefits of helping another person outweigh sacrifice to one's own self. In such cases it will rather prove to be an adaptation rather than problem behavior. Further, helping another will be beneficial if the other person shares some genetic relatedness with the on helping. Closer the relatedness, more the benefit and stronger the tendency to help. This rule can be expressed in formula as:

c<rb

Here, c is the cost to the one helping, r is genetic relatedness between helper and the one getting helped, and b is the benefit to the one receiving help. Here, both cost and benefit is defined in terms of reproductive success.

To put it in an example, if you were to save your relatives from fire at the risk of your life, doing so would be beneficial for you only if you are saving, lets say , three young siblings than only one sibling or your grandfather (who has low reproductive capacity). Thus, Hamilton's rule specifies under which condition altruism can be expected to occur. Relatives with stronger relatedness will always be preferred over strangers. Humans have evolved with adaptations - behaviors, reasoning tendency, personality traits and emotions that favour confirmation to this rule. Similarly, any behavior or trait that goes against this rule will be rejected by selection. This phenomenon is known as evolvability constraints where only the traits that confirm to Hamilton's rule are evolved and passed on to generations whereas traits going against this rule get terminated.

Theoretical implications of Hamilton's Rule:

Following from Hamilton's theory, humans have evolved with different adaptations, mostly psychological for different relatives. Parent child is one type of relationship that is influenced by this rule. Let us see how other relationships are designed following Hamilton's rule.

Siblings:

Sibling relationships are more complicated than a simple equation. Siblings can help and protect each other the best as they share 50% of genetic relatedness. At the same time they are also the strongest competitor for parental resources. This is where sibling rivalry originates from.

Sulloway (1996; as cited in Buss 2011) has suggested differential behavior of siblings based in their birth order. Parental behavior also changes as per the number of children they have which in turn shapes children's behavior. According to Sulloway, first born get more of parent's attention and efforts hence they turn out to be more confirming to the parental rules whereas second born gain better by revolting against instead of confirming to the rules. Youngest siblings however often get better parental resources than middle kids as parents often spend all their remaining investments on the younger one, since youngest child is their last reproductive vehicle. Several researchers have found empirical support for this prediction.

Siblings vs half siblings:

While full siblings share 50% of genetic relatedness with each other, half siblings only share 25% of genetic relatedness. According to Hamilton's rule then, one should be less likely to be altruistic towards half siblings than with full siblings. Two children born to same woman but having different fathers are very much likely to compete with each other for her attention and care.

Grandparents:

Grandparents are share 25% of genetic relatedness with their grandchildren. Evolution has allowed grandparents to develop certain mechanisms that aid helping raising grandchild instead of one's own child. Menopause is the best example of this. The 'grandmother hypothesis' states that older women experience menopause as it stops their reproductive endeavour, allowing them to help their children in raising their kids instead.

Some universal aspects of kinship:

Daly, Salmon and Wilson (1997; as cited in Buss 2011), have made predictions about certain universal aspects of kinship, based on adaptations resulting from inclusive fitness. They suggest an ego centered kin terminology such as 'my parents', 'my brother', 'my niece' etc. Which distinguishes between people that you are connected to genetically and those who are unrelated. Further, they predict that kinship will be distinguished along sex. For example, mothers will be distinguished from fathers, uncles from aunts, brothers from sisters, etc. This is salient as sex implies genetic conformity. Females are always 100% related to the kinds but same cannot be said about the father. Sons have more reproductive opportunities than daughters. Next, the kin will also make distinctions along generation as older generation becomes less and less reproductive wise useful as younger generation becomes more and more useful. The researchers also predict that emotional closeness will mirror genetic closeness. Sixth prediction suggests that elders of the family will always encourage younger ones to be altruistic and cooperative with each other more their natural preference. Seventh prediction coming from inclusiveness fitness theory asserts that one's position in family will be a central aspect of one's self concept. Even today, people often identify themselves as 'I am daughter of_', ' Father of_' , etc. Eighth formulation

suggests that humans across cultures will be aware of different degrees of genetic closeness with relatives, even though their language may or may not make this distinction. Finally, considering the benefits enjoyed as a result of inclusive fitness, kinship terms will be used for persuasion and influencing strangers. For example, one may say ' Hey brother, can you help me with this address?". This is because hearing the term 'Brother' activates kinship preference which might make even a to stranger help you.

5.2.2 Empirical support for theory of implicit and inclusive fitness:

Several of studies support claims made by the theory of inclusive fitness. These studies include observations of humans, primates and some other animals that we share great deal of genetic makeup with.

Mechanisms for kin recognition:

Hamilton's principle expects humans to help their genetic relatives which further adds to their inclusive fitness. In order to help a kin , one first needs to recognize who are one's genetic relatives and to what degree. One way in which humans recognize their close relatives with the help of smell. Newborns often distinguish between their mother and other humans with the help of her smell (Cernoch and Porter, 1985; as cited in Buss 2011). We can often identify which family member wore a particular shirt yesterday by smelling it. There is also evidence of adolescents recognizing their full siblings by smell but not their half siblings.

Humans use the adaptive technique of using specific linguistic terms such as uncle, aunt, mother etc, to distinguish relatives from strangers and from one another. Further, infants are often exposed to these close relatives so that they learn to recognize their kin from early in life. Terminologies also help in classification of relatives. There are cultural differences in these terms. For example, Marathi language has different terms for mother's brother (mama) and father's brother (kaka) whereas English language uses same word to indicate the both (uncle). According to researcher Doug Jones (2003a, 2003b; as cited in Buss 2011), there is a universal grammar that governs kin terminology that consists of three systems: genealogical distance, social rank and group membership. Genealogical distance is degree of genetic relatedness. The genealogical distance between siblings is different from that between an uncle and niece. Elders in the group are usually given higher social rank than younger ones. Membership is determined based on groups such as maternal vs paternal relatives, same sex vs different sex relatives, etc.

Interestingly, physical similarity also helps one identify a close kin. Individuals who are genetically closer to each other often share a lot of facial features, posture, voice texture, etc. Further, humans also tend to distrust a face that looks extremely dissimilar to oneself. Humans can also detect who are related to each other in a group of strangers as well. This serves the adaptive value of knowing who will ally with whom if the situation comes or who is exploitable given their kin is not nearby.

Thus, humans have four ways of identifying kin: through association, odor, linguistic terminologies and physical resemblance.

Altruism among humans:

A Study by Burstein, crandall & Kitayama, 1994, tested two types of altruistic behavior extended to people of different genetic relatedness to participants. Two types of behaviors were significant helping behaviors, such as helping in case of life and death matters and trial helps such as giving food or some money to someone. They wanted to see if participants were more likely to help their closer relatives than strangers, also if more help is provided to younger ones (as they carry more reproductive potential) than older relative. Participants from US and Japan were presented with some scenarios such as being able to help only one person from a burning building vs picking up a couturier for someone. Results showed that helping in such scenarios increased with increasing degree of genetic relatedness, especially in case of life and death scenarios. Helping in such cases also decreased as victim's age increased. 70 years old were much much less likely to be helped than a 10 year old.

In another interesting study by Stewert-Williams (2008; as cited in Buss 2011), participants reported feeling emotionally closer to their mates and friends than to their siblings; however when cost of helping increased, they were found to be helping siblings more and more than friends and mates. Studies from several non industrial cultures have also found evidence for food sharing happening more among kin households than others in the village.

Kin relationship seems to be more valuable to women than men. Patriarchal societies require a woman to shift with husband's family after wedding. However across several cultures women are found to maintain contact with their kin after marriage as well. They often stay with kin when pregnant, after divorce or death of spouse (Buss, 2011).

Genetic relatedness and emotional closeness:

Selection has also lead to development of some psychological mechanism that help humans in survival and reproduction, as well as to maintain their inclusive fitness. Emotional closeness is hypothesized to be one such mechanism. Korchmaros and Kenny 2001(as cited in Buss, 2011), extended Burnestein's study by asking participants to rate emotional closeness to different genetic relatives on a 7 point likert scale. Then they were presented with hypothetical situations involving an opportunity to show altruism. Results showed that not only genetic relatedness but emotional closeness also predicted tendency to help; further, individuals were found to be feeling more emotional closeness to kin who are genetically closer than those who are genetically distant. Humans also tend to have more frequent contact with their genetically closer relatives which in turn increases their tendency to help them (Kurland and Gaulin, 2005).

Vigilance over Kin's Romantic Relationships:

As it is followed from inclusive fitness, mating success of not only oneself but one's relatives especially sibling is also important for evolutionary tasks. Therefore it is expected that humans will be quite vigilant regarding good and bad qualities of mates of their siblings, especially mate of their female siblings as females carry more value with respect to passing genes than males (Faulkner and Schaller, 2007 ; as cited in Buss 2011).

Kinship and stress:

Several researchers have noted relationship between stress and presence/ absence of kin. Cortisol is a chemical secreted during stress than prepares body to fight the stress. However the flip side of excessive secretion of cortisol is its adverse effect on reproductive and general health of the human. Studies have found that children living with single parent, especially mother show higher levels of cortisol in blood than those living with both the parents. But, if a kin stays nearby a child raised by single parent, the levels were found to be lower. Similarly, children living with step parents or step siblings showed highest stress levels (Flinn et al, 2005; as cited in Buss 2011). This is because presence of a genetically related kin provides better protection to a child than living with those unrelated.

Grandparents and grandchildren:

As females are always 100% sure that the child is theirs, when it comes to grandparents, a mother's mother is hypothesized to invest most in children of her daughter than any other grandparent. A maternal grandmother is 100% sure that her daughter is her own and the daughter in turn is sure that her kinds are her own. Taking care of daughter's children is always beneficial for maternal grandmother. Other grand parents, that is , father's mother and father and mother's father have some chance of either their child or grandchild not being genetically related to them. A study conducted by DeKay(1995; as cited in Buss 2011), asked participants to rate all four of their grandparents on measures of physical similarity, resourcefulness, time and knowledge. The findings supported the hypothesis regarding maternal grandmother.

5.3 SUMMARY

Survival and reproduction are two most important evolutionary tasks of all the humans. Accordingly, they have developed some physical and psychological mechanisms that help them ensure successful completion of these tasks. Children are primary way of passing on one's genes and keeping one's species alive hence taking care of children becomes at most importance. Mothers and fathers differ in their investment in child. This is because since female is responsible for gestation and delivering the baby, she is always 100% sure that the baby is her; however for the father there is always a chance that baby was conceived with another male. Therefore, fathers across cultures are found to be less involved in child rearing than mothers. Since all the children are equally important to parents, they are

likely to advocate equal distribution of their resources among children. However as a person shares only 50% genetic relatedness with their sibling, every child is likely to want more parental resources for themselves and less for their siblings. This leads to parent offspring conflict.

The principle of inclusive fitness states that a person's reproductive success can be calculated not only by adding their direct reproduction- their children , but also reproductive success of their kin. Hamilton's theory further explains humans engage in altruistic acts when helping another person is more beneficial than keeping resources to oneself. This usually happens when other person is genetically close and has better reproductive potential. Therefore people are more likely to help their close relatives followed by distant relatives and least to strangers. Hamilton's rule is represented in the formula: c<rb

Humans have also developed mechanisms such as physical resemblance, emotional closeness, odor recognition, terminologies, frequent contact etc. to identify close kin and help them. Abundance of empirical evidence supports principle of inclusive fitness and Hamilton's rule

5.4 QUESTIONS

1. Explain reasons behind differential parental investment in their children
2. Describe parent offspring conflict
3. What is the theory of inclusive fitness?
4. Explain the principle of inclusive fitness with the help of its empirical correlates.

5.5 REFERENCES

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6

PARENTING AND SOCIAL BEHAVIOR - II

Unit Structure

6.0 OBJECTIVES

After studying this chapter, the students will be able to:

- Understand the concept of cooperation and how it evolved in humans
- Understand what is reciprocal altruism
- Understand how human brain has adapted to do various forms of social exchange

6.1 GROUP LIVING FOR HUMANS

Humans, unlike most of the other animals, do not have bodily weapons such as sharp nails, ability to run fast, wings to fly or sharp teeth to protect themselves in dangerous situation. One way for them to protect themselves from a predator is by living with other humans, in the form of a group. Now, if a group is to function well and provide protection to its members, cooperation is a must trait. As such, humans have made several psychological adaptations that ensure smooth functioning of the group. This also means that humans have mindset that allows for solving problems of group living. Cooperation, aggression, conflicts are some of these problems. In this chapter we will study the problem of cooperation in detail with the help of theories such as reciprocal altruism, costs and benefits of friendships, commonly seen examples of altruism in nature and explanation of adaptations made by human mind to make this all possible.

6.2 EVOLUTION OF COOPERATION

Friendship is one of the oldest forms of cooperation. Defined in simple words, cooperation is an act of working towards a same goal. It is a form of social exchange. Cooperation is what makes a family or a big international company run smoothly. This behavior is seen across culture

and across different species as well. The personality trait of agreeableness is an asset for cooperation wherein people who are high on agreeableness usually cooperate well and prove to be a good team member.

However, selection process prizes survival of the fittest. As such understanding why one would help another survive at one's own cost is an evolutionary puzzle. In last chapter we understood that one may engage in altruism when survival benefits of saving a genetic relative are greater than cost of loosing one's own life. We also understood that people are more likely to help others closer in genetic relatedness and younger in age. But a friend is not genetic relative and is often of similar age as oneself. Why would one help such a person who may very well be a competition to win over a healthy mate? This is also known as the problem of altruism. The theory of reciprocal altruism answers this question.

6.2.1 Reciprocal altruism:

In simple words, the theory of reciprocal altruism says that a human may help non relative in situations where there is a possibility of the help being reciprocated in future. This way, the one who is helping and the one who is being helped, both benefit. Lets take an example of hunting. Getting a good game is not a frequent event. One day you may get enough meat for your family, other days you may walk miles without any hunting success. One way to solve this issue is becoming friends with another hunter. That way you both can help each other. If, for example, today you get a big game, you may share it with your friend. Tomorrow if you do not score any thing but your friend does, he will share is food with you. Moreover, you will also be more powerful if you hunt together than alone. Thus, you both benefit out of this deal. It is a win win situation.

Speaking in evolutionary terms, humans who developed this trait of reciprocal altruism will be more successful reproductively and thus outnumber those who are selfish. Reciprocal altruism can then be conceptualized as 'cooperation between two or more individuals for mutual benefit' (Tooby and Cosmides, 1992; as cited in Buss, 2011). Thereby the terms cooperation, reciprocation, social exchange mean the same.

The phenomenon of reciprocal altruism also calls attention to the problem of cheating where one may only enjoy the benefits without returning the favors. Interestingly, humans have also evolved psychological mechanisms to detect cheating. We will discuss those adaptations a little later in this chapter. Let us now study an interesting phenomenon that throws light on important aspects of cooperation, something known as the prisoner's dilemma.

Prisoner's dilemma:

The workings of cooperation can best be illustrated by a hypothetical situation called as prisoner's dilemma. In this situation two people are accused of committing a crime that they have indeed committed. Both are put in separate prisons with no means of communication with each other

and are inquired separately by police. If none of them confess, there will be no proof of their crime and both will be set free. However if one of them rats out against the other then this person will be rewarded and the other one will get even stricter punishment. If both of them confess, they will be sentenced to jail.

This situation presents a dilemma as although the rational action is to confess, it will lead to punishment for both than if they trust each other and do not confess. Here, term R is used for reward of setting free, P is the punishment each receives of both confess, T is temptation to confess against the other prisoner and S is sucker's pay off which is punishment one gets of the partner rats out and one does not.

Lets examine this dilemma from player A's point of view. He will benefit if he defects but his partner does not. But if his partner defects, he will be better off defecting as well. Thus, defecting appears more appropriate than mutual cooperation although that option is mutually rewarding. In real life as well, both the parties benefit with mutual cooperation but there is always the temptation to benefit even more by defecting against another while they do not.

After a lot of research, the winning strategy for this game is discovered to be Tit for Tat when the fame is played multiple times. It is effective if first move is to cooperate and then reciprocate whatever move the other one does. This is also called as 'contingent reciprocity' as one's cooperating behavior depends on behavior of another (Trivers 1985; as cited in Buss 2011).

6.2.2 Cooperation among non humans:

Cooperation is an adaptive behavior not only for humans but for majority of species on earth. Let us examine some examples.

Vampire bats:

These bats consume other animal's blood. They usually venture out to suck blood during night and hide in caves during day. Their groups consist of female bats and their off springs with male bats going out to collect blood when they get old enough. Interestingly, they can live without blood only for three days. Blood sucking, like hunting is unpredictable. Then how do they deal with this problem?

Bats seem to be using reciprocal altruism. Studies have found them donate collected surplus blood to their friends who have helped them in past. This tendency to give blood to friend bat also increases when friend is close to dying than when their need is mild. Starved bats were also more likely to return the help. Thus, vampire bats have developed mechanism for reciprocal altruism for survival.

Chimpanzees:

An observational study by de Waal (1982; as cited in Buss 2011) studied group behavior of chimpanzees. Chimpanzee's world is as full of politics

as human world. In this study they observed behavior of an alpha male A who dominated the group with his physical strength and showed sexual prowess by mating with majority of the female of the group. With time he grew old and a young chimpanzee B gained more power. He soon dethroned chimpanzee A with physical fight and left him with 0 mating partners. However chimpanzee A formed an alliance with an newer younger chimpanzee C and together they fought against chimpanzee B. They of course won this fight and C, being the younger one secured 50% of mates whereas A gained 25% of mates which is much better than 0 mates when he was dethroned.

Thus, cooperation helps chimpanzees to sustain power and survival in the group.

6.3 COGNITIVE ADAPTATIONS FOR SOCIAL EXCHANGE

As cooperation and altruism is a form of social exchange, humans have developed several adaptive mechanisms that ensure behaviors consistent with it.

Social contract theory:

Theory of reciprocal altruism states that people help others so that they get help in return. However acts of reciprocal help do not occur at the same time, always. If I fail at hunting today and you help me by sharing food that you have hunted, I cannot return this favor immediately by giving you food. This creates the possibility of cheating. Cheating is the biggest threat to cooperation.

Cosmides and Tooby have developed theory of social contract to explain social exchange in such situations. They propose that humans have evolved mechanisms to detect and avoid cheaters. With this, cheaters will be at disadvantage as cooperators will align with other cooperators and avoid them. They have proposed five such mechanisms that humans have developed:

1) Ability to recognize different individuals:

First of all, to return the favor you gave me, I should be able to distinguish you from other humans so that in future when you are in need I can come forward to help. Second, if I get deceived by someone once, I can avoid them next time only if I recognize them. Therefore humans have developed ability to recognize difference in humans to distinguish between them effectively and form alliance accordingly. We are so good at it that it almost seems to be an obvious behavior instead of a specific ability. Alternatively, lesion to brain area involved in face recognition leads to a condition called 'Prosopagnosia' which is inability to recognize faces.

2) Humans also have memory of interactions with others. This memory capacity allows them to remember how the other person behaved in

the past when it comes to helping them right now. This helps them decide if the other one was cooperator or cheater. It also helps them remember who owes whom so that know false claims can be made by those who owe help to the other person. If you fail at this ability, you may end up giving much more benefits than what you receive.

3) In order to clearly convey to the other what I need in return of the favor I did, I should be able to communicate my needs to them. This is third capacity that humans have developed to facilitate reciprocal altruism. Similarly, if I don't express my anger and disappointment when being cheated on I will be perceived as a weak member of group and become more prone to being cheated again.

4) In line with previous ability, along with ability to communicate one's own value to others, we also have the ability to understand other's value. Recognizing when one is in need and how much and what kind of help they need can help alter help we provide accordingly. Giving someone a rug to cover themselves when what they need I actually food, help provided will be worthless. Recognizing other's value and need can help the helper maximize value of their help.

5) Last but one of the most useful ability is to compute cost and benefit independent of the specific items exchanged or help provided. There are innumerable number of things that humans can exchange- food, cloths, tools, shelter, status, protection, etc. One needs to compute worth of each of these items and compare them. Giving someone shelter in exchange of a pen will be a costly deal. The ability to conceptualize cost and benefits in general terms than specific items helps overcome this problem.

Thus, social exchange theory proposes five abilities that humans have evolved that ensure cooperation and deal with problem of cheating. By being able to recognize different humans, remembering interactions with them, communicate and understand one's own and other's value and compute cost and benefit irrespective of the specific item exchanged helps to do that.

Cheater detection adaptations - logical problem solving:

How humans solve logical problems gives a glimpse of adaptations made in accordance to social contract theory. Logical problems are often presented in form of If "p then q". For example, if it rains, the roads will be wet. This is then followed by a problem statement such as 'p'; 'roads are wet'. The respondent has to arrive at the logical inference from given information. The correct answer is "q" ; 'then the roads will be wet'. Thus, when situations state if p then q , whenever p is true logically q is also true.

Studied have shown that humans are not so good with drawing such logical inference. A study by Pinker et al., 1997 (as cited in Buss, 2011) presented college students with premise that in a room there are some biologists, some archaeologists and some chess players. None of the

biologists are archaeologists but all the biologists are chess players. More than 50% students concluded from this information that none of the archaeologists are chess players. Which is an incorrect conclusion. It is also possible that some archaeologists are ALSO chess players. The information says all biologists are chess players. It does not say only and only biologists are chess players to conclude that archaeologists are not chess players.

Wason card problem is another famous logical problem solving situation that sheds light on human problem solving skills. It presents respondents with 4 cards, two of them have a letter written on them - A and K and other two have number written on them - 2 and 7. The task is to check only two cards to see if the rule 'If a card has vowel on one side, it will have an even number on the other side'. Majority of the people select card A and 2. Now, while selecting card A is correct choice as it has to have an even number on the other side failing to which the rule is proved false, turning card 2 is not useful here. Again, like in previous paragraph, the rule says if a card has vowel on one side it will have even number on the other. It does not say only and only the cards with vowel on one side have even number on the other. Which means even cards with consonants may have an even number on the other side. Therefore any letter could be behind card 2 which will not prove anything about the rule. The correct answer is card 7. If card 7 has a vowel on the other side then the rule is falsified.

To put this in abstract terms, given "if p then q', concluding 'p therefore q' and 'not q not p' are the only logically correct inferences. Rest two possibilities = 'q therefore p' and 'not p not q' are logically incorrect conclusions. Studies show that humans are good at concluding if p then q, but make logical fallacies when it comes to other conclusions.

Evolutionary psychologists explain this finding by stating that humans are not evolved to solve abstract problems. Solving abstract problems did not serve any purpose to our hunter gatherer ancestors. However solving social problems was indeed useful to them. Consider this example, you have to verify the rule that "If a person drinks alcohol they must be twenty one years or older"(Cosmides and Tooby, 1992; as cited in Buss 2011). There are four people sitting at the table: a sixteen year old, a 25 year old, someone sipping wine and someone sipping juice. Which two people would you approach two check if the rule is being followed? Majority of the people correctly pick someone sipping wine and sixteen years old. Interestingly, this answer follows same logic as above abstract problem. If p (drinks alcohol) then q (must be 21 or above). Concluding p therefore q (sipping wine therefore has to be 21 or older) and 'not q not p' (sixteen years old therefore shouldn't be drinking alcohol) is logically correct answer.

Thus, evolutionary psychologists showed how humans are better at solving social problems than abstract problems because solving social problems, specifically detecting cheaters provided them an evolutionary advantage than solving abstract problem, even though the logic remains

the same. People are much much more efficient when it comes to solving problems presented in the form of a social contract. The context familiarity is not the key here as people solve such problems even when presented with weird rule such as 'only those with swollen arm will get entry in mall'. Human mind is evolved to detect cheaters no matter what the rule is. This is a cross cultural evidence.

Further, different brain areas are devoted to such adaptations. In a famous study of a patient with brain damage to amygdala and some areas of frontal cortex, it was found that the person was still good with precautionary problem like " always wear mittens when holding hot pan' but his ability to solve social contract problems such as mentioned above was deteriorated. Such people are more likely to get deceived by others.

Cheater detection adaptations – memory:

Remembering who has cheated in past provides an evolutionary advantage as one will not associate with that person again. Some studies have rather found that people are better at remembering faces of cheaters better than remembering faces of cooperators from past. This could also be because cheaters are usually fewer than cooperators as majority of the humans are evolved to cooperate than to cheat. Some studies also claim that cheaters give away some subtle cues through their facial features and expressions that give a hint to respondent as to whether they are cheaters or not and thereby also help them to remember such faces better even without actual knowledge about whether the person is cheater or not. For example, while smiling indicates a potential cooperator, expressions of contempt indicate a potential cheater. People are even better at making these judgments if they have been primed by asking them to remember an occasion when they were cheated, before they are asked to make these judgments.

Thus, humans have evolved memory as well as attentional capacities that aid in cheater detection.

Cheater detection adaptations - detection of altruists:

Interestingly as humans have evolved mechanisms to detect cheating, cheaters have also evolved mechanisms to avoid getting detected. In turn, humans have also developed tactics to detect altruists, moreover genuine motives behind altruism.

Evolutionary psychologists have conducted studied similar to Wason card problem but tweaked to detecting genuineness. The rule states " if X helps, she gets the point". The four cards are "X helps" , "X does not help", "X takes point", "X does not take point". The cards of "X helps" and "X does not take point" shows genuine altruism. Majority of the respondent correctly select this. This performance was equally good as performance on cheater detection task and both were still better than solving abstract problems.

Surprisingly, people have shown ability to detect genuineness in others even by watching a silent clip of strangers going about everyday tasks.

Altruists are hypothesized to display a more genuine smile than non altruists.

Thus, detection of cheaters and detection of altruists are two broad adaptations that humans have developed that facilitates reciprocal altruism.

Added benefit for altruists - costly signaling theory:

Altruists definitely enjoy the direct benefit of getting another person's help after helping them. However they also enjoy an added benefit they get by advertising their altruist acts. When one popularizes their altruist acts or others talk about X person's altruism. He/she appears more attractive and trustful for others. Others may then try to form alliance with X individual in future. The benefit is then not limited to receiving help form the person you helped, nut also from others who have heard about your altruism.

This is why people are often more helpful when others are watching. This also explains why popular personas often post their generosity on social media, in order to influence their followers.

The theory of costly signaling or costly helping is related to this. Only those who have extra resources can afford to help others. By displaying their altruism, throwing dinner parties, giving expensive gifts, charity, donations etc. one is also informing others subtly that they have more than enough resources available. This is an attractive quality when it comes to mating as well as forming alliances and maintaining groups. Those who sacrifice themselves for others often get more respect by the group and receive help when needed. Such people also have higher status in the group. Studies have found that people often tend to help more when doing it publicly than when doing it anonymously.

Banker's paradox:

Banker's paradox throws light on an unexplored aspect of altruism. Usually the number of people asking for loan are more than the amount of money a particular bank has. Therefore a banker needs to decide whose loan should be approved and whose not. People having good salary, for example, are safer risk than someone with low salary. However those in need of money are precisely the people who lack money or steady income source. They are the ones in need. Should they then be helped or not?

To apply this paradox to social exchange, often people in need are the ones who have poorest resources; that is why they are in need. A person struggling with cancer would need your help. However he cannot provide any benefits to you immediately or in near future. What should you do in such cases where reciprocity of altruistic act is a thin possibility?

Evolutionary psychologists argue that this dilemma is resolved by considering A. character of the person. Whether the person is known to be a cooperator or cheater. B. How likely they are to help you in future. And C. Whether the help needed is within your capacity or not. Answers to

these questions ensure that one's investment in others will not go loss. By this rule, those who are in temporary need are more attractive recipients of help than those whose problem is likely to be persisting.

As a recipient of help, one way to ensure you get help when needed is to become 'irreplaceable'. Tooby and Cosmides (1996; as cited in Buss 2011) have highlighted some of the ways to become irreplaceable. Some of those are maintaining a reputation that highlights one's qualities, identifying priced values that are difficult to achieve and trying to achieve them, learn skills, hang out with groups that value your qualities and avoid groups that do not need your attributes, trying to do away anyone offering same qualities as you do.

Forming friendships is one way to ensure you get help when needed. Evolutionary psychologists have suggested some ways to ensure this such as being with friends who find you irreplaceable, who want same things as you, being with friends who understand your needs, etc. The ability to distinguish between fair weather friends and real friends is extremely adaptive.

Friends also provide a lot of other evolutionary benefits apart from providing help. They often share their food and shelter with us, may provide protection, introduce us to potential mates or even be those mates. Cost and benefits of having friends differ by several dimensions such as gender. While a same sex friendship carries potential of intra sex rivalry, opposite sex friendship offers the advantage of potential mating. For men, opposite sex friendship offers possibility of short term. While for women a benefit of opposite sex friendship is protection. Opposite sex friends also provide one information about their own gender which further helps them get mates.

Apart from friendships, humans also form cooperative coalitions. These coalitions offer benefits such as sharing food, hunting together, attacking the other group together, etc. These coalitions also have to deal with problems of defection and free riders. Defectors are group members that withdraw in the face of difficulty and free riders are members that share group benefit without providing anything for group's success. The strategy of punishment is often used to deal with this problem. However, punishing brings with it a potential cost. When A punishes B, A looses chance of getting helped by B in future at the same time he incurs cost of potential revenge from B. That is why punishing is also called as an altruistic act that one performs for the sake of their group. Such group members are well respected in the group and enjoy a higher status. They are also perceived to be more trustworthy and fair. This makes them attractive member for forming alliances. This is the benefit they obtain in return of the cost of being the one punishing the defectors or free riders.

6.4 SUMMARY

This chapter has shown us a true meaning behind the saying "man is a social animal". From mating, parenting to friendships, everything is being

done to ensure survival and reproduction of the species. Group living is an ancient behavior and several psychological mechanisms are evolved to facilitate that group living. Reciprocal altruism, cooperation, detection of cheaters, detection of cooperators, etc are some examples. It is interesting to observe claims of evolutionary psychologists in this regard in modern ways of living as well. In line with evolutionary hypothesis, we see even today how people are more likely to help their close relatives than strangers, help strangers when there is a possibility of getting reward for it, pick on subtle cues of someone's cooperativeness, advertise one's cooperative behavior, etc. The changing times however present different problems and solution to those problems lies in modern time adaptations. Human species will continue to survive on earth successfully if they develop these adaptations.

Group living provides evolutionary advantage to humans as it helps them protect themselves better from predators, gives better mating opportunities and any other help when needed. For group living to happen smoothly humans have to solve problems of group living. These problems are solved by mechanisms such as altruism, cooperation, aggression, etc. Cooperation and altruism are a form of social exchange. Altruism is seems contrary to selection theory as it involves helping another at one's own cost. This question is answered by the theory of reciprocal altruism. The theory of reciprocal altruism states that humans help another when there is a possibility of getting help in return from that person. For example, in a hunter gatherer society, if one fails to obtain any game today, his neighbor may help him by sharing some of the meat that he has obtained. Tomorrow if the neighbour doesn't have any food, you are likely to return that favor. Thus, both the parties benefit. Prisoner's dilemma is a popular way to study cooperation strategies. In this game, participants are presented with an imaginary situation where two people are being inquired separately for crime they have committed. If both of them confess, they go to jail, if one rats out the other, he gets reward while other gets a stricter punishment, if both deny the crime, they are set free. This presents a classic dilemma as if one party doesn't confess but other one does, they get in more trouble; confessing seems better than that. After several trails, researchers have found the best strategy to solve this problem, when played multiple times is to cooperate first time and then mirror partner's response. Cooperation is found among not only humans but also non humans like vampire bats and chimpanzees.

Humans have evolved several cognitive adaptations that facilitate reciprocal altruism. These adaptations involve ability to differentiate between persons so as to know who is helpful and who is not, having memory of the interactions with others, ability to communicate one's value to others and to understand other's value, ability to calculate cost benefit analysis that is not connected to the specific items exchanged.

Along with adaptations that facilitate reciprocal altruism, it is equally important to detect cheaters. Studies have found that people are better at solving logical problems when presented in terms of social exchange and not in abstract terms. This is because it was always more adaptive for our

ancestors to solve problems of social exchange than solve abstract problems like "if p then q". These findings are received from experiments that use Wason card task. Further, humans also have better memory to remember faces of cheaters than faces of cooperators. They also seem to be paying better attention to cheater's subtle physical cues than cooperators. This gives an evolutionary advantage to detect cheaters easily. Studies have been conducted where participants are shown pictures/ silent videos of strangers going about their regular tasks and still people give accurate ratings about how cooperative the person in picture/video is likely to be. It is hypothesized that cooperator's display a more genuine smile than people low on cooperation. This helps us estimate how cooperative the person is likely to be.

Altruism also gives another advantage when someone's altruistic acts are displayed. When others come to know about a person's altruistic acts, that person is perceived as more trustworthy and attractive. Others are more likely to form an alliance with such a person. Friendships and cooperative coalitions are some other forms of social exchange.

6.5 QUESTIONS

1. Write a note on cooperation as a mode of social exchange
2. Explain principle of reciprocal altruism
3. Discuss cooperation among non human species with the help of examples.
4. What cognitive adaptations have humans developed to facilitate social exchange?
5. How do humans detect cheaters?

6.6 REFERENCES

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7

SOCIAL BEHAVIOR AND SPECIFIC TOPICS - I

Unit Structure

7.0 OBJECTIVES

After studying this unit you should be able to:

- Understand the adaptive problems critical to survival.
- Know the strategies adopted by human beings to deal with adaptive problems.
- Understand aggression as a solution to adaptive challenges.
- Understand differences in pattern aggression as a function of sex.
- To study and analyze different type conflicts arises between sexes.
- Understand an evolutionary basis of Morality and Art
- Acquire the knowledge about how emotions evolved.

7.1 INTRODUCTION

We often say that a man is a social animal and cooperates with each other to function in a society. However plenty of instances and empirical evidence show that human beings sometimes go against the very nature of a social being and choose to aggress against each other. We come across a number of such news articles featuring such aggressive acts often in media, news channel and television. Have we ever wondered why human beings engage in any sort of aggression? What function does aggression serve? Are there any differences in the pattern of aggression as a function of sex? What type of conflict typically occurs between men and women? Can we trace back the aggression and common conflicts to evolutionary roots? Do we only engage in the activities critical to survival? Why do we often spend time pursuing hobbies and art, which are not necessary to survival? In this unit, We will try to look at all the questions from an evolutionary perspective.

7.2 AGGRESSION AS A SOLUTION TO ADAPTIVE PROBLEMS

Have you ever thought of using aggression as a strategy to overcome any of the problems? If so, Is aggression a new age phenomenon or can it be traced back to the time of evolution? Empirical evidence suggests that our ancestors gained multiple benefits by using aggression as a tactic and by inflicting harm on rivals. In this unit we would make an attempt to understand how aggression is used as a solution to solve adaptive problems and also will shed a light on sex differences in aggression. Now we would look at some of the leading candidates of adaptive problems for which aggression might be used as an adaptive solution (Buss & Duntley, 2008; Buss & Shackelford, 1997b).

1) Co-opting resources of others:

Human beings show a tendency to maintain a reserve of all the goods critical for survival and reproduction such as Fresh water, access to land, tools, food and weapons. There are plenty of ways to acquire these resources such as social exchange, stealing and Aggression. On an individual level, one can secure valuable resources simply by using physical force whereas on group level people can form alliances to forcibly acquire resources from others. Co-opting resources as a strategy is used across all the ages. In childhood, aggression is often seen over toys and territory (Campbell, 1993). In adulthood, aggression could be used as a means to secure money or other goods by beating others. The perpetrator creates a threat of aggression in the minds of the potential victim. This threat or fear might be enough for the potential victim to give up the resources in order to protect or prevent the danger.

2) Defend against attack:

The potential victims of aggression often stand at high risk of losing their valuable resources, status and reputation. In extreme cases victims might also suffer serious physical injuries or death, placing the survival and reproduction at stake. Defending against the attack is therefore used as a means to prevent the harm or loss of face and honor. According to Buss, (2005) women as well as men sometimes risk their own lives in order to prevent the injury, abuse, or death of their mates or children (Buss, 2005).

3) Inflicts costs on Intrasexual Rivals:

Having an access to the valuable members of the opposite sex is critical to survival and reproduction. A Cost inflicted on the rival of the same sex can add to the potential benefits to the perpetrator. Aggression is therefore used as a strategy to make the same sex rival less desirable. The intensity of the aggression may range from verbal remarks to extreme physical acts such as killing.

4) Negotiate status and Power Hierarchies:

Literature on evolutionary psychology sheds light on how aggression can be used as a means to establish oneself in the social system or to increase one's power in existing societal structure. Putting oneself in danger to kill the enemies is often regarded as an act of bravery. Men who put themselves in danger in warfare to kill enemies are regarded as brave and courageous and consequently experience an elevation in their status within the group (Chagnon, 1983; Hill & Hurtado, 1996).However this strategy does not work for all the groups all the time. Aggression in some groups can result in decline in status.

5) Deter Rivals from future aggression:

A reputation of aggression can be used as a strategy to deter others from co-opting one's valuable resources. Establishing oneself as the aggressor in the society would discourage the other members from occupying one's

resources. For example, We would not ever think of stealing anything from a Don.

6) Deter Long term Mates from sexual infidelity:

Past reseach has indicated that Male sexual jealousy is the leading cause or precipitating context of spousal battering (Buss & Duntley, 2011; Daly, Wilson, & Weghorst, 1982). A sizable number of research from shelters for battered women indicates that extreme jealousy on the part of their husbands or boyfriends is the key cause of the beating (Dobash & Dobash, 1984). Men use aggression as a means to discourage women from partnering with other men.

7.2.1 Why are men more violently aggressive than women?

An ample amount of cross cultural research unequivocally shows that men are Often the perpetrators and also the victims of the violent crimes. We must make an attempt to understand what are some explanations accounting for the same.

The model of intrasexual comepetition or competition between same sex rivals is one such explanation. There is a difference in minimum obligatory parental investment as a function of sex. Men often make minimum obligatory parental investment and hence can produce more offspring than females can. Females are seen as a limited valuable resource particularly in the species where females invest much more in the offspring than the men do. This discrepancy leads to differences in the variances in reproduction between the sexes. Research evidence show that Selection often favors riskier strategies (including intrasexual competition) within the sex that shows the higher variance.

Let us now move to understand aggression in females. If the earlier discussion creates an impression that females do not engage in any form of aggression, that is certainly not true. Women typically are involved in less risky and less violent forms of aggression than do men. According to research conducted by (Buss & Dedden, 1990; Campbell, 1993, 1999) women may vilify the physical appearance of their rivals by using derogation as a strategy.

As put by Campbell, women need to place a higher value on their own lives than do men on theirs, given the fact that infants depend on maternal care more than on paternal care.

7.3 EMPIRICAL EVIDENCE FOR DISTINCT ADAPTIVE PATTERNS OF AGGRESSION

The empirical evidence with no ambiguity shows that men engage in aggression more than women. With this most obvious prediction we would also look at the other possible combinations of aggression where reverse also might be true.

7.3.1 Evidences for sex differences in same sex aggression

Let us now move to understand and explore the factors accounting for sex differences in same sex aggression.

1) Body Differences in Design for Combat:

Natural sex differences in the body takes us back to the long evolutionary history of male aggression. Research evidence certainly shows that men surpass women in terms of overall physical strength. According to a documented research finding, Compared to women, men have 61 percent more total muscle mass. In addition to that men as compared to women have 75 percent more upper arm muscle mass and 91 percent greater upper body strength. They have taller and heavier bodies, thicker jaw bones, thicker skin, stronger bones, greater bone density in their arms, higher muscle- to-fat ratio. They generally have broader shoulders that makes it easy for them to use a weapon (Lassek & Gaulin, 2009; Sell, 2012). As compared to women, Men show greater interest in using their bodies in physical competition often resulting in engagement of activities such as boxing, wrestling, ultimate fighting, mixed martial arts, and high-impact tackle football. (Deaner et al., 2012).

2) Result of a Meta-Analysis of Sex Differences in Aggression:

The result of a number of meta-analysis studies conducted both previously and recently paints a clear picture of Aggression in males. All the studies retain and further support the past evolutionary prediction that men engage in aggression more than women.

In 1986, Psychologist Janet Hyde conducted a meta-analysis of studies of the effect sizes for sex differences in different forms of aggression (Hyde, 1986). Before discussing the results of meta-analysis studies let's briefly discuss the concept of an effect size. An effect size, in this context, refers to the magnitude of the sex difference which can be understood as (0.80,large), (.50 medium) and (.20 small). The effect sizes for various forms of aggression are averaged across dozens of studies and they are as follows: aggressive fantasies (.84), physical aggression (.60), imitative aggression (.49), willingness to shock others in an experimental setting (.39). The data shows greater male scores on aggression.

3) Same-Sex Homicides:

One way to study the pattern of aggression is by considering the rate of homicide in a particular culture. One such attempt was made by Daly and Wilson in 1988. They compiled same-sex homicide statistics from thirty-five different studies. These studies represented a broad span of cultures from downtown Detroit to the Basoga of Uganda. Here it is important to understand that the rate of homicide differs widely from culture to culture. Therefore the most useful way to compare the sexes is to calculate the proportion of same-sex homicide committed by males (i.e., the percentage of same-sex homicides that are male–male homicides).A subset of statistics is shown in Table 7.1. From the data it is clear that the rate at

which same sex homicide rates for men are necesarily higher than same sex homcide in females.

As Daly and Wilson puts it,"Indeed there is no evidence that the women in any society have ever approached the level of violent conflict prevailing among men in the same society" (Daly and Wilson, 1988).

Table 7.1 Same-Sex Homicides in Different Cultures

Location	Male	Female	Proportion Male
Canada, 1974–1998	2965	175	.94
Miami, 1925–1926	111	5	.96
Detroit, 1972	345	16	.96
Pittsburgh, 1966–1974	382	16	.96
Tzeltal Mayans, Mexico, 1938–1965	37	0	1.00
Belo Horizonte, Brazil, 1961–1965	228	6	.97
New South Wales, Australia, 1968–1981	675	46	.94
Oxford, England, 1296–1398	105	1	.99
Scotland, 1953–1974	172	12	.93
Iceland, 1946–1970	10	0	1.00
Denmark, 1933–1961	87	15	.85
Bison-Horn Maria, India, 1920–1941	69	2	.97
!Kung San, Botswana, 1920–1955	19	0	1.00
Congo, 1948–1957	156	4	.97
Tiv, Nigeria, 1931–1949	96	3	.97
Basoga, Uganda, 1952–1954	46	1	.98
BaLuyia, Kenya, 1949–1954	88	5	.95
Jol Uo,Kenya	31	2	.94

Source: Daly, M., & Wilson, M. (1988). Homicide. New York: Aldine de Gruyter. Copyright © 1988 by Aldine de Gruyter. Reprinted with permission.

4) Same-Sex Bullying in Schools:

Aggression may not always be seen in an extreme form such as aggression; milder forms of aggression are also seen, often in school settings such as bullying.

One research was conducted to understand the patterns of bullying by Ahmad & Smith in 1994. The sample involved 226 middle school children, ranging between eight to eleven year old and 1,207 high school students ranging from eleven to sixteen years old. An anonymous questionnaire was given to participants which asked the following questions: State how often he or she had been bullied by others , state how

often he or she had accompanied others in bullying others at school, and the particular forms or type the bullying .The researchers concluded that significant sex differences were observed on all measures.

With respect to bullying others, 54 percent of middle school boys and 34 percent for same-age girls reported to have engaged in bullying. Whereas for the older-aged high school students, 43 percent of the boys and 30 percent of the girls reported bullying.

Researchers further examined sex differences in violent aggression. A significant sex difference was observed for type or form of bullying. In the high school student sample, 36 percent of the boys and 9 percent of the girls reported being physically hurt, such as being hit or kicked, by a bully. Another finding supported our earlier evolutionary hypothesis that aggression can be used as a strategy to co-opt the resources from others. With respect to losing their belongings, 10 percent of the boys and 6 percent of the girls reported to have lost their belongings as it was taken by someone. Interestingly girls surpassed boys in two measures of aggression. With respect to verbal aggression, 74 percent of the girls and 57 percent of the boys reported that others had called them nasty names. It was also observed that girls spread rumors about other girls and most often used nasty names were as follows: “bitch,” “slag,” “slut,” and “whore.” The findings also indicated that such type of bullying was common among high school girls but not among the middle school students. Derogating the same sex rival might be used as a strategy in intrasexual mate competition in order to solve the adaptive problems.

Series of research conducted cross-culturally have produced similar findings. One such study was conducted in Turku, Finland. Researchers involved a sample of 127 schoolchildren who all were fifteen years old. The researchers used the techniques of peer nomination and self-report (Bjorkqvist, Lagerspetz, & Kaukiainen, 1992). Let us now understand the findings of the experiment in brief. Direct Physical aggression (tripping, taking things from another, kicking and striking, seeking revenge in games, and pushing and shoving) was seen more in boys than in girls. The rate of aggression in Boys was more than three times the rate of aggression in girls.

With respect to Indirect aggression (gossiping, shunning another person, spreading vicious rumors such as revenge, breaking contact with the person, and befriending someone else as revenge) the reverse was true. The rate of Indirect aggression in fifteen-year-old girls was approximately 25 percent higher than the same-age boys.

In summary we can say that ample amount of research continues to support the earlier evolutionary predictions and concludes that overall the percent of aggression is higher in males than in females and females are more likely to use less violent forms of aggression than males.

5) Aggression in an Australian Aboriginal Community:

Anthropologist Victoria Burbank studied a community called Mangrove of roughly 600 Australian aborigines. Researcher recorded a data of 793 aggressive episodes, some through her own observation and few as reported by other residents. She further categorized these episodes and assessed sex differences in frequency within each category. It was concluded that men overall used more dangerous forms of aggression than women did. Further she also examined sex differences in aggression by using any weapon (knife, gun, spear). Of ninety three cases in which the weapon was used, ninety percent of the episodes were committed by men but women only accounted for 3 percent of cases.

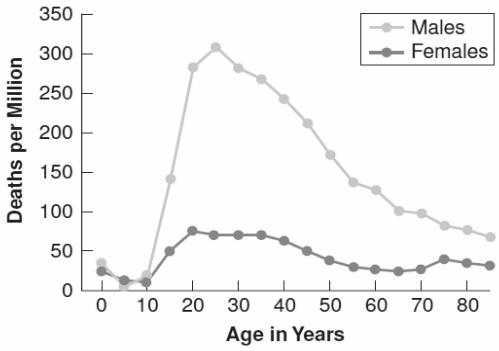
6) The Young Male Syndrome:

From the above discussion so far we have learnt that men are more likely to use riskier and violent strategies than women. However, this finding needs to be understood with caution as the research evidence also shows that not all men use aggressive techniques always. This finding calls for an explanation for same sex variation.

One explanation comes directly from the empirical investigation conducted by Wilson and Daly (1985) who called this as the "young male syndrome.". A large sample was drawn from the United States in 1975 and homicide rates by age and sex of the victim are shown in figure (7.1). Let us briefly look at the findings discussed below.

As it can be seen in the figure, both men and women do not differ in the likelihood of becoming homicide victims up to the age of ten. The pattern however changes from adolescence. With the start of adolescence the victimization of men begins to hike and peak is observed at mid-twenties. The statistical data indicates that at this age men are six times more likely to become the subject of homicide than women. Noticeably the rate of victimization does not remain the same afterward. A steady drop is observed in the rate of men's victimization post mid-twenties as they avoid the use of risky strategies.

Figure 7.1 Homicide Victimization Rates by Age and Sex for the United States in 1975.



Source: Wilson, M., & Daly, M. (1985). Competitiveness, risk-taking, and violence: The young male syndrome. Ethology and Sociobiology, 6, 59–73. Copyright © 1985, with permission from Elsevier Science.

The young men syndrome also accounts for findings from episodes of violent conflicts from collective aggression such as riots and gang fights. Across many countries and states it has been observed that there is an association between percentage of coalitional aggression and percentage of males in the age group of fifteen to twenty-nine, as this group accounts for most coalitional aggression.

7.3.2 Context triggering Men's aggression against Men:

Aggression ranges from mild to severe, and homicides represent the most extreme form of aggression and violence. Men are most often the prep[arators as well as the victims of the violence. Let us now explore some causal factors that underlie male- male homicide.

1) Marital and Employment status:

Having access to valuable resources is critical to survival and reproduction. Therefore lack of such resources and failure to attract long term mates may be one of the causal factors linked with male -male homicide. The findings of various studies indicate that victims and perpetrators share the same characteristics. A study by Wilson & Daly (1985) of Detroit homicide revealed that 43 percent of the victims and 41 percent of the perpetrators were unemployed. Similarly with respect to marital status, 73 percent of the male perpetrators and 69 percent of the male victims were unmarried.

2) Status and Reputation:

Research evidence suggests that there is a link between reputation and aggression. One laboratory experiment proved it scientifically. Participants in a study were provided with status cues (Imagine being graduated from college) which would act as a prime. Upon priming they were told that there are other two competitors competing for a prestigious job. They were asked to imagine the other competitor did some careless act (spilling drink on table) and did not apologize. Then they were asked the question, how likely are they to insult the opponents.(Insult, hit, push, or get "in the face" of the rival). It was found that compared to women, men significantly reacted to the direct aggression when they were primed with status cues. Series of experiments on tribes in the Ecuadorian Amazon confirmed that Status and warriorship are highly correlated.(John Patton ,1997, 2000)

3) Sexual Jealousy and Intrasexual Rivalry:

Evolutionary literature suggests that exual jealousy is a significant factor in triggering same-sex aggression and homicide. A summary of various studies of same sex killings involving love triangle shed light on the same. The findings summarized in these studies indicate that 92 percent killings

were male–male homicides and only 8 killings percent were female–female homicides.

7.3.3 Causal contexts Triggering Women's aggression against Women:

Females also uses number of strategies against other same sex competitors mainly to maintain her mate's loyalty and mate's resources and protection. Females often use social exclusion to get rid of female competitors through verbal aggression.(Benenson, Hodgdson, Heath, & Welch, 2008). A study by Buss & Dedden, (1990) concluded that women were more likely to use verbal derogation as a strategy to fend off their competitors than did men. The competitors were derogated against the physical appearance (Calling them fat, ugly, mocking body shape and size) and sexual promiscuity. sexual promiscuity as a tcatic was context dependent. For men the dimension of sexual promiscuity was only significant while looking for a long term mate and not a short term mate.(Buss & Schmitt, 1993).

In summary, females prominently use aggression to attract the potential mates and to secure the resources from mates and to fend off the competitors.

7.3.4 Contexts Triggering men's Aggression against women:

So far we have seen that men are more likely to aggress against other men. Let us now understand certain factors that might cause men to aggress against women. Sexual jelousy appears to be the leading cause for such aggression across cultures.(Daly & Wilson, 1988) In one study involving battered women, It was observed that fifty-seven of sixty battered women admitted extreme jealousy and possessiveness on the part of their husbands (Hilberman & Munson, 1978). Men who typically engage in spousal homicide or aggression are triggered by following factors. One such factor is suspicion of sexual infidelity and second being suspect of termination of relationship by a women. Age of the women also plays a role as age is a powerful cue indicating girls reproductive value. Therefore, Young wives and girlfriends stand a higher chance of being killed than older ones (Daly & Wilson, 1988; Shackelford, Buss, & Weeks-Shackelford, 2003).

7.3.5 Contexts Triggering Women's Aggression against Men:

It might seem rare but the research suggests that under certain circumstances women as well inflict violent aggression on the men. Let us now briefly look at certain factors that can cause women to aggress against men. Women most often use aggression as a last resort in order to save oneself or to defend against the attack. The factors accounting for the aggression are as follows: Male sexual jealousy, saving oneself from an enraged husband over a real or suspected infidelity, prolonged history of physical abuse. (Daly & Wilson, 1988; Dobash et al., 1992). Spousal homicide, although rare, may be perpetrated by women at times.

7.4 CONFLICT BETWEEN SEXES

Donald Symons (1979) very correctly said that In every age the battle of the sexes is largely a battle over sex. Men and women must cooperate with each other for survival and reproduction. In this section we shall discuss some of the major forms of sexual conflict such as conflicts over the occurrence and timing of sex, sexual aggression and defenses against sexual aggression. Sexual conflict may be defined as "a conflict between the evolutionary interests of individuals of the two sexes"(Parker, 2006, p. 235).

7.4.1 Strategic Interference theory:

Human conflict occurs at many levels and in many forms. Research has suggested that conflict between sexes typically occurs as a function of use of different evolutionary strategies. We have seen that use of strategies differ as a function of sex. With respect to short term mating men more than women have evolved strong desire for sexual variety whereas women have evolved to be more discriminating. These conflicting desires cannot be fulfilled simultaneously hence result in a phenomenon of strategic interference. If a woman refuses any sexual advancement until some emotional commitment from a man is made and if a man still persists in his sexual advances inspit of refusal from a woman then this results in interference in women's strategy. Strategic Interference phenomenon is applied to a number of situations including timing of sex, at workplace in form of sexual harassment, in dating situation through deception, sexual infidelity in a marriage etc. Research has also indicated that negative emotions (Anger, distress, upset) are evolved to solve the adaptive problems of strategic interference as these emotions alert people to the sources of distress thereby ensuring a prompt action.

In summary, Strategic interference occurs in a situation where a person employs a particular strategy to achieve a goal and another person obstructs the successful enactment of that strategy.

7.5 CONFLICT ABOUT THE TIMING AND OCCURENCE OF SEX

Failure to agree upon the timing and occurence of sex is one of the leading cause of conflict between men and women. This prediction was supported through a number of studies. One such study involved 121 college students who were asked to maintain a diary, indicating their dating activities over a span of four weeks. Findings of the research revealed that around 47 percent students reported one more incidence of disagreement about their desired level of sexual intimacy (Byers & Lewis, 1988)

7.5.1 Conflict Over Sexual access:

In this section we shall discuss some common conflicts that occur between sexes.

1) Inference about sexual intent:

Another source of conflict between men and women is the incorrect inference of sexual interest. Men often incorrectly infer the sexual interest on the part of women when it may not exist. It has also been documented that when men are in doubt they are more likely to infer sexual interest and occasionally may act on those inferences. A series of studies have suggested that men are more likely to exhibit sexual misperception bias and may misinterpret simple friendliness or smiling as cues to sexual interest. (Perilloux, Easton, & Buss, 2012). A real world demonstration of the same was documented by Browne in (2006). A supermarket chain had implemented a 'Superior customer service' Programme in which the employees were asked to smile at and make eye contact with the customers. However, it was observed that male customers misinterpreted these gestures by female employees as sexual cues, resulting in sexual comments or even stalking. This misinterpretation or bias often results in a conflict.

2) Deception about Commitment:

Research has shown that men often intentionally deceive women about emotional commitment. The cost of being deceived by a partner is more heavily paid by a woman than a man resulting in untimely pregnancy and unaided childrearing. Since the cost to be paid is very high, women must be vigilant about the cues of deception. Research suggests that women use naturally evolved strategies to protect oneself against deception. Women are more likely to take extended time, energy and commitment before consenting to sex as it allows more time for stringent assessment.

3) Cognitive Biases in Sexual Mind Reading:

We often make inferences about a number of things including others intentions and emotional states. How attracted is he to her? How committed is she to him? Is he being friendly or is it something else? However our inferences may not always be correct and we may go wrong sometimes. Some common miss-inferences includes, Misperception of sexual interest when it does not exist, or being unaware about the true romantic yearnings when it does exist. According to Error management theory (EMT), It is important to understand that the cost-benefit ratio of the above two circumstances are not identical. (Haselton, 2003; Haselton & Buss, 2000, 2003;Haselton & Nettle, 2006). In case of fire alarms which are set to detect any hint of smoke, the cost of failure to detect the real fire is much heavier than the occasional false alarms. The asymmetry of cost-benefit if occurs in evolutionary time creates tension and produces systematic bias.

The first is sexual overperception bias in men where men appear to incorrectly infer sexual interest on the part of women when it does not exist.

The second such bias is the commitment skepticism bias in women (Haselton & Buss, 2000).It states that it is designed to underestimate

men's actual level of romantic commitment to her early in courtship. A study showed that this bias was present in young women but not in older women (Cyrus et al., 2011).

EMT provides a newer perspective on problems faced by humans in mating, and it further suggests that some errors reflect functional adaptations rather than actual problems in the psychological system.

4) Sexual withholding:

Women often use the strategy of sexual withholding exercised through acts such as being sexually teasing, saying no to intercourse, and leading a man on and then stopping him. By doing so women preserve their ability to choose, allowing only those men of high quality who will be ready to invest emotionally. This way women only allow sexual access to the men ready to make heavy investment. Women's strategy of withholding the sexual access and men's strategy to have it sooner crates the conflict between sexes.

7.6 SEXUAL AGGRESSION

In this section we shall discuss different forms of sexual aggression by men and what strategies women use to guard against it.

7.6.1 Sexual Harassment:

As put by Terpstra & Cook, (1985) Sexual harassment is defined as "unwanted and unsolicited sexual attention from other individuals in the workplace" .The conflict or disagreement between the sexes to have sexual access at times result in workplace in form of sexual harassment. Sexual harassment ranges from mild (unwanted staring and sexual comments) to severe acts (physical violations, such as the wanted touching of breasts, buttocks, or crotch) .Victims of sexual harassment are typically women who are young, physically attractive and single. Women over age forty-five are far less likely than younger women to experience sexual harassment (Studd & Gattiker, 1991). Reactions to sexual harassment support the assumption of strategic inference theory as it results from a difference between men's and women's evolved psychologies (Browne, 2002, 2010).

7.6.2 Sexual exploitation and cues to sexual exploitability:

A new research has shed light on men's strategies of sexual exploitation and women's co-evolved defenses to prevent it. Researchers have identified three types of cues to sexual exploitability and they are as follows. Psychological cues (e.g., shyness, low cognitive ability, permissive sexual attitudes), incapacitation cues (e.g., intoxication, fatigue), and physical cues (e.g., small body size, shorter walking gait) (Goetz, Easton, Lewis, & Buss, 2012). Those men who use sexual exploitation as a strategy have adaptations to identify observable cues in women and that further indicate ease of sexual exploitation. Women pursuing short-term mating strategies at times intentionally display cues to

sexually exploitability as a tactic to pursue their mating goals such as attracting highly desirable mate for short term relationship (Goetz, Easton, & Meston, 2014, Buss, 2003).

7.6.3 Sexual Aggressiveness:

Sexual aggressiveness is one of the risky strategies used by men which minimizes their investment for sexual access, but also costs them high in form of retaliation and damage to reputation. In one study where women were asked to rate 147 upsetting actions men could do to them on a scale of 1 (not at all upsetting) to 7 (extremely upsetting) ,women gave a rating of 6.5 to sexual aggression. However, men often underestimate how unacceptable sexual aggression is to women.

7.7 JEALOUS CONFLICT

We have so far reviewed problems in choosing a mate. However, it is also equally important to retain the mate once chosen to fulfill the reproductive potential. There are several threats to mate retention. The first threat is the presence of mate poachers and the second threat is mate's infidelity.

Evolutionary psychologists have stated that the emotion of jealousy has evolved to deal with such adaptive problems. Sexual jealousy promotes vigilance by signaling men to circumstances in which his partner might be unfaithful. It also enables men to increase their efforts to fulfill their partner's desires to have less incentives to stray.

7.7.1 Sex differences in Jealousy:

Many studies have explored the sex differences in psychology of jelousy. One such study conducted by Buss et al (1992) revealed that men are more likely to give more weight to cues to sexual infidelity, whereas women to give relatively more weight to cues to a long-term diversion of investment, such as emotional involvement with another person . In a test of hypothesized sex difference involving 511 students, asked participants to compare two distressing events: (a) their partner having sexual intercourse with someone else or (b) their partner becoming emotionally involved with someone else. 83 percent of the women but only 40 percent of the men reported their partner's emotional infidelity more upsetting. In contrast, 60 percent of the men and only

17 percent experienced their partner's sexual infidelity as more distressing. In a subsequent study conducted in psycho-physiological laboratory, revealed that the men became more physiologically distressed by the sexual infidelity whereas exhibited greater physiological distress at the thought of emotional infidelity (Buss et al.1992).

7.8 SEX DIFFERENCES IN THE TACTICS OF MATE RETENTION

Psychological mechanisms evolve only if they are translated into behavior that would solve an adaptive problem such as

- Deter Mate Poachers
- Deter a partner from committing infidelity
- Lower the odds that the partner will defect from the relationship

It is important to note that mate retention techniques can range from vigilance to violence.

Strategies commonly used by Men

According to several studies exploring sex differences in mate retention techniques have found out that men are more likely to use following techniques.

1) **Concealing a partner:** Exercised by taking a partner to a party where other men are present or insisting that she spend all of her free time with him.

2) **Threats and violence:** Threatening to hit a man who is making moves on his partner or picking a fight with a man interested in her

3) **Resource display :** buying the partner jewelry, giving her gifts, and taking her out to expensive restaurants

4) **Submission and self-abasement:** groveling and saying that they would do anything their partner wanted to get the partner to stay in the relationship.

Strategies by women

Commonly used techniques of mate retention by women are as follows.

1) **Enhance their appearance:** making up their faces, wearing the latest fashions, and making themselves "extra attractive" for their mates.

2) **Inducing jealousy :** by flirting with other men in front of them, showing interest in other men to make their partners angry, and talking with other men to make their partners jealous

However it is important to note that these strategies are not always used by all women all the time.

7.8.1 Context Influencing Mate retention Strategies:

Several contexts influencing Mate retention strategies are given below.

1) Reproductive Value of the Wife :Effects of Age and Physical Attractiveness

There are two powerful cues to a woman's reproductive value and fertility are her youth and physical attractiveness. These two qualities appear to be highly desirable to men across cultures (Buss, 1989a; Kenrick & Keefe, 1992). A study conducted by reported that men married to younger women admitted devoting greater effort to the adaptive problem of mate retention.

Similar findings were also reported by Graham-Kevan and Archer (2009).It was found that men who mated to fertile women exercised more economic, threatening, and intimidating forms of controlling behavior, and were more likely to isolate them from social contact with others.

2) Ovulation Status of the Woman:

Several studies have reported that men seem to increase their mate-retention efforts at precisely this time in their partner's menstrual cycle (Gangestad, Thornhill, & Garver-Apgar, 2005; Haselton & Gangestad, 2006; Pillsworth & Haselton, 2006).

3) Income and Status Striving of the Husband:

Women's mate retention tactics were hypothesized to be a function of husband's income and status striving. Status striving refers to the degree to which the husband devotes his efforts to getting ahead in the status and work hierarchy (Buss & Shackelford, 1997c).

7.8.2 Destructive side of mate retention: Violence towards partners:

Have you ever wondered why one would commit violence against a partner? As discussed earlier, use of violence is often used as a strategy which serves several functions. Use of violence and threats by men helps to restrict a partner's autonomy thereby reducing the odds that the partner will commit infidelity or defect from the relationship (Wilson and Daly ,1996).

Spousal homicide is the most destructive form of violence towards a partner. In case of spousal homicide, even the perpetrator bears a heavy cost as he loses an access to the valuable resource hence this continues to puzzle the evolutionary researchers. Age also plays a role as Young and attractive women might be more vulnerable to violence from their partners. Research studies have confirmed this prediction. The wives who are at greatest risk of being killed by their husbands are in their teenage years; the lowest rates of spousal homicide are among postmenopausal women (Daly & Wilson, 1988).

7.9 EVOLUTION OF MORALITY

So far we have explored the topic of aggression which has received considerable research attention. Now let's discuss the topic that has received very less attention from evolutionary psychologists that is Morality. Moral behavior is indeed important in our day to day lives. Before exploring morality in detail let's explore some philosophical issues. Naturalistic Fallacy is one such fallacy. It argues that just because a behavior is found to occur 'naturally' it doesn't follow that the behavior is somehow 'right' or 'good. It is implied in this fallacy that ought cannot be derived from it.

7.9.1 Free-riders and the social contract:

Human beings as social animals accept a number of cooperation strategies for long term gain. One such model is Social contract. Social contract can be implicit or explicit in which an individual member agrees to bear a short term cost to immediate personal benefit in order to gain long term benefit through the means of cooperation. These societal systems are always susceptible to free riders, those who obtain some benefit without effort or cost. This can destabilize the functioning of the group and hence free riders pose a serious problem. Needless to say those human beings have evolved a number of special mechanisms to detect cheating

Human beings are predisposed to be sensitive to detect or identify social cheating. A number of studies conducted in this domain have confirmed this prediction.

Leda Cosmides and John Tooby conducted series of experiments using Wason Selection Task (abstract logic task, originally developed by the psychologist Peter Wason conducted with an aim to study people's intuitive understanding of scientific reasoning) The task is as follows :

- The subjects are presented with 4 cards with a rule such as, 'If a card has Cards vowel one side it always has an even number on the reverse side'
- After the presentation of cards, subjects asked to say which card or cards they would turn over to test the validity of the rule.
- A result of this experiment revealed that only 25 percent of the subjects could answer the test correctly.
- Cosmides and Tooby however showed that when the identical task was formulated ('Only people older than 18 years are allowed to drink beer') and presented in a form of social contract 75 percent of the subjects could provide the correct answer.
- Cosmides and Tooby argued that the findings concluded that we have a specialized cognitive module that was extremely sensitive to social cheating.
- These findings and the interpretation spurred a lot of debate in the field.

Needless to say that people seem to be particularly sensitive to social cheats. The experimental evidence shows that people are more likely to remember a person's facial features if they were made aware about any cheat committed by that person. Similar Group identity or group membership may also help people to believe that another person will cooperate as a sense of obligation. Group identity is explicitly displayed by clothing and hairstyles, religion and other beliefs or dialect and styles of behavior. Similar dialects can also be effective in controlling free riders. Reputation can also be used to control free riders. If we want other

people to cooperate with us, we must have a reputation of being honest. This has also been tested empirically.

7.9.2 Strong reciprocity and the prosocial 'instinct':

In a series of experiments, Fehr and his collaborators explored the interesting phenomenon of Strong reciprocity and the prosocial 'instinct' through different games. Let's now look at some of the experimental findings in brief.

- The games used in the experiments were one shot games which means only a single round is played.
- All the individuals in the game remain anonymous and genetically unrelated to ensure that findings cannot be explained by the theory of reciprocal altruism and kin selection.
- Findings of the experiment suggested that a significant proportion of people repay gifts willingly and also punish individuals who violate fairness and co-operative norms.
- Fehr has termed the behavior as 'Strong reciprocity' in which an individual willingly sacrifices the resources for both rewarding the fair behavior as well as to punish the unfair behavior in spite of no present benefit nor future economic rewards for the person.
- Another notable finding from these experiments was that not all individuals play fair and some use a strictly selfish strategy.
- In this kind of game one factor significantly influences the findings, that is whether individuals believe they will be punished for non-co-operation.
- When there is no punishment for non-cooperation, low cooperation is observed and it even tends to decline with each successive round.
- Some of the later studies also documented that Willingness to punish is not unconditional as willingness to punish decreases when the costs become too high.
- Herb Gintis, through a mathematical model, showed that through evolutionary history human beings have faced several extinction problems, (floods, famines and other environmental catastrophes) on a regular basis and under such circumstances groups with high numbers of reciprocating increases the survival chance of the group. Further it showed that the balance between the two forces means that, at equilibrium, both selfish individuals and strong reciprocators co-exist.

7.9.3 Social embeddedness:

Human decisions are always embedded in a social context. Most of the studies highlighting the importance of social context have conducted 'The 'Ultimatum Game'. Let's understand this game in brief. This game is played between two players. The first player is given a sum of money and

is asked to make an offer to share it with a second player who is generally anonymous. The second player has two options, Either he can accept the offer thereby splitting the money as per the offer or he can refuse it.

Studies showed that when conducted in modern Western societies, offers typically average 50 per cent of the initial stake, which further suggest that the player making the offer is responding to expectations of fairness although not purely economical. In contrast when the same game is conducted in traditional societies, average offers ranged between 26–58 percent. Two factors explained the variance. One was the extent to which the group's economic production required co-operation (Limited cooperation to larger cooperation) the extent to which the society concerned was integrated into (and thus dependent on) a market economy.

Patterns of rejection also revealed the importance of social institutional factors. It was revealed that, In western subjects only offers below about 30 percent of the stake are rejected implying that something is better than nothing. In contrast traditional societies showed much greater variability. In some cases it was observed that only offers below 16 percent were rejected, whereas in some others cases only offers above 70 percent were accepted.

7.10. EVOLUTION OF ART

Do human beings only engage in activities that are critical to survival and reproduction? Why do we have several activities which are not directly related to survival? Why do we spend our time enjoying movies, enjoying sports or learning any new art? What motivates us to pursue our hobbies? In this section we will try to explore some evolutionary explanations of the same. Evolutionary psychologists have come up with two explanations to account for the same.

1) Display Hypothesis:

As put by Miller(1998) "Culture is "an emergent phenomenon arising from sexual competition among vast numbers of individuals pursuing different mating strategies in different mating arenas". Further Miller suggested that cultural displays by male increases sexual access. This might explain why men have produced more art and literature than women. Further evidence for cultural display comes from the pattern of age distribution of cultural displays as the majority of art and music is created by men in young adulthood (intensely engaged in intrasexual mate competition). However critics report that display hypothesis is not sufficient to explain why there is a variation in the content and why some people enjoy solitary enjoyment of art and music in absence of cultural display.

2) Explanation by Pinker:

"Let people take pleasure in shapes and colors and sounds and jokes and stories and myths" (Pinker, 1997, p. 523). According to Pinker, the answer lies in evolved mechanisms in the mind. He further suggested that Humans

have learned to artificially activate existing mechanisms by inventing cultural products that mimic the stimuli for which the mechanisms were originally designed. For eg. Color vision for location ripe fruit, can be activated by making the paintings that imitate these patterns. Pinker has made a similar explanation for patterns of music. He suggested that music is sensitive to six mental faculties.

- Language Such as lyrics from songs
- Auditory scene analysis : According to this, we must segregate sounds coming from different sources, such as a animal call in a noisy forest
- Emotional calls (Such as whining response or crying, moaning, baying, and cheering are used as metaphors to describe musical passages)
- Habitat selection such as thunder, rushing water, growls, and other sounds might signal safe or unsafe environments
- Motor control (e.grhythm, a universal component of music, mimics the motor control needed for a variety of tasks, including running and chopping, and signals qualities such as urgency, laziness, and confidence.

In summary, According to this argument by Pinker, the patterns of music which we find pleasurable, are those that artificially mimic natural stimuli that our evolved mechanisms were designed to process. This hypothesis is not only limited to art and music but also to movies and fictions. The plots, stories, narration of comedy or tragedy activates pleasurable sensations by triggering a host of evolved mechanisms. No wonder why popular and successful movies/novels contain patterns of intrasexual competition, mate choice, romance, and life-threatening hostile forces of nature.

7.11 EVOLUTION OF EMOTION

In this section we would illuminate our understanding about the most interesting topic in evolutionary psychology that is evolution of emotion. The topic of emotion has been studied from multidisciplinary perspectives. The research surrounding emotions dates back to Darwinian Theory. Emotions are special modes that are shaped by natural selection. As put by Darwin, evolution shaped not only the physical characteristics of an organism but also its mental processes and behavioral repertoires.

An evolutionary account of emotion takes into consideration how emotions came to exist. Emotions are evolved to coordinate an organized response to deal with an adaptive challenge. For example, Presence of a predator, initiates an emergency response on the part of a potential victim.

How many emotions exist? Can we categorize emotions simply under positive and negative domains ? Evolutionary psychologists, through years of research, have tried to address these questions. Some theories argue for

simple dichotomous categorization while some argue for complex understanding of multiple emotions. Irrespective of the stand all the theorists agree that valence and intensity are necessary qualities of emotions (Smith & Ellsworth, 1985). The ability to detect emotions initiates appropriate responses. For. eg Excessive heat (signaling danger) can initiate escape response. Different theorists have listed several basic emotions, but all include fear and anger, and most also include joy and sorrow. Some theorists have proposed a few more additions to the list of emotions.

As put by Cosmides and Tooby, selection has shaped thousands of discrete domain-specific mental modules to deal with different situations (Cosmides & Tooby, 1994) and that emotions are superordinate programs which coordinate the modules (Cosmides & Tooby, 2000).

Evolutionary psychologists reject the idea of existence of sharply distinct emotions and sharp distinction between emotions and moods. They believe that both are special states which are evoked in these situations as a tactic to increase fitness.

7.11.1 The Origins and functions Different Emotions

Years of investigation in the field of emotional research have reached several conclusions.

1. Emotions do not have clear boundaries: There is an overlap in both the characteristics of situations and the patterns of response that are adaptive responses. For example, given two similar situations such as confronting a snake and confronting a bear, adaptive responses also would be the same.

2. The clear taxonomy of emotions may not exist.

3. No specific description of emotions and their subtypes can be accurate and precise.

Sometimes specific emotions are often discussed in relation to their special functions. Emotions are often perceived as a special mechanism through which fitness in certain situations is enhanced. Positive emotions motivates the organism to take advantage of environmental opportunities while negative emotions motivate the organism to save oneself from misfortune. A response of fear to danger often motivates escape. For example, If we confront a snake, thereby inducing fear response, we are more likely to run away to avoid potential threat (escape). An emotion of disgust often initiates avoidance response or vomiting, interest leads to exploration; lust motivates seduction and sexual intercourse; sorrow motivates ask for help or giving up on fruitless endeavors, and so on (Gross & Keltner, 1999; Plutchik, 2003).

Fear conditioning and classical conditioning often allows the organism to learn associate things and anticipate the event which further serves the

adaptive benefit. Operant conditioning also offers an additional benefit as it allows the organism to predict the likely consequences of an event.

However it is important to note that different emotions do not correspond to different specific functions; instead, they correspond to the adaptive challenges encountered in different situations.

7.11.2 Appraisal theories of Emotion:

Appraisal theory of emotion was originally put forward by Magda Arnold in 1960. Appraisal theory argues that organisms are constantly alert to changes in the situation that might have implications for their well-being. It further states that emotions involve situation appraisals and physiological response and action (Frijda, 2006). Emotions arise from appraisal of several situations such as

- Novelty and environmental changes
- Intrinsic pleasantness/unpleasantness
- Goal obstacles or facilitators
- Unpredictability
- Agency (event caused by self, other, or circumstances)
- Controllability
- Compatibility with social norms or personal values

Appraisal theory believes that we don't focus on concrete theories of emotions, rather we appraise the abstract appraisals from where the emotion arises. For example, a new element in the situation such as a tiger elicits fear. A loud noise of lightning may induce fear but if the loud noise is coming from honking it may induce anger.

7.11.3 Social Emotions:

As man is a social animal and connected to society, social emotions carry a special significance and needs to be treated differently. Research so far has greatly focused upon the benefits of reciprocal exchange in social situations (Cosmides & Tooby, 1992; Fessler & Haley, 2003; Hammerstein, 2003; Trivers, 1971). Benefits of reciprocal exchange is often studied using Prisoner's dilemma, which represents a situation in which two players who are separated and have no means of communication must individually choose between two options : cooperating or not cooperating. The results typically show that people play fairly on the game and try to maximize their benefit. It has also been found out that people tend to be generous initially and give strict responses to defections by others. Different strategies may elicit different emotions such as Mutual cooperation elicits friendship and trust whereas temptations to defect induces anxiety. Defection creates guilt whereas suspicion is useful when the other might defect; and if she or he does, anger is beneficial. Several studies have highlighted the role of emotions in reciprocal exchange. The

recent work in the domain has focused on irrationalities on the part of human behavior that is not in line with self-interest.

7.12 SUMMARY

In this unit we began by explaining the evolutionary roots of Aggression and how aggression is being used to solve adaptive problems, critical to survival and reproduction. We then explained the sex differences in aggression and under what circumstances both sexes might aggress against each other. We also reviewed some common conflicts that are often seen between sexes as a result of use of conflicting strategies. Further, some commonly used mate retention strategies were also discussed. In addition to aggression and conflict we discussed the evolutionary base of morality. Human beings do not only engage in activities critical for survival as we spend a lot of time pursuing hobbies, watching movies, doing other activities and art.Hence we also tried to explore the evolution of art in brief. At last we shifted our focus to the concept of emotions and then discussed how emotions are to be understood from an evolutionary perspective.

7.13 QUESTIONS

A) Write long answers:

a) Discuss the use of aggression as a solution to adaptive problems in detail.

b) Elaborate different tactics of mate retention in detail.

c) Discuss the context triggering men's aggression against men.

B) Write short notes:

a) Jealous conflict

b) Origin and functions of emotion

c) Sexual aggression

d) context triggering women's aggression against women

e) Evolution of art

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8

SOCIAL BEHAVIOR AND SPECIFIC TOPICS - II

Unit Structure

8.0 OBJECTIVES

After studying this unit you should be able to:

- Understand the definitions of status, Dominance and Prestige
- Discuss what functions do these hierarchies serve.
- Understand the other side of the dominance spectrum: being submissive
- Explore the evolutionary logic underlying the use of submissive strategies.
- understand Cognitive Evolutionary psychology

8.1 INTRODUCTION

In the later part of this unit, we will discuss how dominance hierarchies are formed in Human and nonhuman species and what functions they serve. We shall also focus on the sex differences in the formation of status hierarchies. We shall also review various correlates of Dominance and sex differences in the strategies used by men and women. Thereafter we shall analyze the other end of the dominant continuam that is being submissive and will explore the evolutionary logic underlying the same followed by understanding evolutionary cognitive development and modularity of mind in brief.

8.2 DOMINANCE AND STATUS IN NON HUMAN SPECIES

As put by Robert Frank (1985), We come into the world equipped with a nervous system that worries about rank. Why do human beings strive to get social recognition ? Why are people so concerned about their reputation and honor?

Several researchers have studied and documented the existence of this phenomenon in non-human species such as crickets. Research findings show that crickets often store an account of their fights with other crickets. In addition they also remember the history of success and failure of each such fight.(Dawkins,1989). Consecutive success allows the cricket to emerge victorious and aggressive thereby increasing the chances of seeking sex from female crickets.

"Pecking Order" is one such phenomenon which explains how order is established amongst hens. Hens initially fight with each other and gradually understand that each hen is superior to and subordinate to other hens thereby subsiding the fights. Once the order is established it helps both superordinate and subordinate hens. Dominant hens gain advantage as their rank is established and subordinate hens get advantage as they can avoid injury by not fighting with the dominant hens.

All out fighting is not an effective strategy as it is costly for both victor and the loser. Researchers further believed that subsequent behavior of loser and victor is linked with some changes in the nervous system. Researchers tested this assumption with a pair of crayfishes. Two subordinate crayfishes were put in one territory and it was found that one crayfish shifted from subordinate to dominant status. Their neurons were tested two weeks later and it showed that the neuron was excited by the serotonin. In another Trial two dominant crayfishes were put in one territory and they proved the saying that 'More than one male crayfish cannot inhabit the same territory without determining who the boss is' (Barinaga, 1996). Out of two dominant crayfishes one was forced to take a subordinate position even though the crayfish continued to be aggressive, at the cost of life. (Barinaga, 1996, p. 290).

The dominance and status order is also evidently seen in the case of chimpanzees. In chimps, the number of times an animal receives submissive greets from the other animal is considered to be an indicator of dominance. Sometimes the submissive chimp also brings certain objects such as leaf sticks for the dominant chimp. The Dominant male chimps often walk around and make themselves look deceptively large and heavy. The dominant chimp gets an adaptive evolutionary benefit by having increased sexual access to females (de Waal, 1982). A survey of 700 studies, conducted by Ellis (1995) reported that the animals with middle to high ranking typically get more reproductive advantage over the low ranking animals.

Cummins documented certain characteristics of the dominance hierarchies and they are as follows. The status hierarchies are not static as individual animals continue to compete for the higher position. Injury or death of a dominant animal, creates instability and creates a hurry to fill the void position. Dominance is not primarily indicated by physical size but rather social skills (Cummins, 1998, 2005).

8.3 EVOLUTIONARY THEORIES OF DOMINANCE, STATUS AND PRESTIGE

In this section, we will try to understand the theoretical perspective underlying dominance, status and prestige. With a sound base of a theory we will try to decode what function does dominance and status serve? Why do people strive for prestige? How hierarchies are established in groups and what functions do they serve? What benefits do they offer for the dominant and subordinate members?

We need a comprehensive theory to help explain why status striving is more prevalent in males than females. A good theory should also focus upon the benefits that the subordinates get if any. It should also further explain why people strive for equality at the same time and differentiate between dominance and production hierarchies.

Dominance refers to force or threat of force. An individual may enjoy the additional benefits or status by establishing himself as dominant through the use of power. Prestige, in contrast, is regarded as “freely conferred deference.”, and it is domain specific. Dominant individuals often induce fear in subordinates whereas prestigious individuals evoke admiration.

8.3.1 Prestige signaling, altruism, and reputation:

Research evidence has shown that Costly signaling is found to be prominent in acquisition of prestige (Bliege Bird & Smith, 2005; Boone, 1998; Plourde, 2008). According to Anderson & Kilduff (2009) ,In traditional hunter gatherer societies signaling involved throwing lavish feasts for the group, providing meat from difficult-to- capture prey animals, or displaying knowledge that is valuable to the group. In modern societies, one may acquire prestige by making personal sacrifices indicating commitment to the group, establishing oneself as competent on

the tasks that are valuable to the group, or being generous (Andeson & Kilduff,2009). It is important to understand in the context of prestige, giving is highly regarded than receiving.

In one experiment people were being asked to contribute some money (either anonymously or in the presence of the group) in order to help needy people. Researchers then analyzed changes in the social reputation by considering if an individual has offered or did not offer charity and whether their behavior is observed by anonymous or by group. As expected it was found that those people who contributed for charity experienced a dramatic increase in their prestige and reputation when contributions were made publicly (Bereczkei, Birkas, & Kerekes, 2007).

8.3.2 Leadership and followership: The service-for-prestige theory:

Have you ever observed the functioning of any specific group? you will realize that not all members in a group are equally dominant or eually submissive, rather some choose to lead while others choose to follow. What qualities of leaders are most valued by the group? In this section we will understand the evolved strategies of leading and following and what adaptive benefits do they offer to an individual to solve adaptive problems.

According to Van Vugt, (2006) Leaders are those who possess knowledge and competence relevant to the task and they are high in intelligence, and signal high levels of generosity by making costly sacrifices for the group. Leaders are the ones who have special qualities to solve problems related to group conflict and coordination and often emerge from group consensus.

Service-for-prestige theory of leader–follower relations states that leaders often provide significant services to the group which benefits the followers and ensures good outcome for the group. The key services may include Knowledge, wisdom, organizational skill, Intelligence in respective domains. These services provided by the leader offer adaptive benefits for the follower such as defense group against attack, more effective warfare on rival groups, or simply superior habitat selection for the group. In exchange, followers offer social prestige to the leader.(Prestigious salutations such as your highness, chairperson etc).

The qualities which will be helpful in solving adaptive problems are often sought in the leaders. In the context of hunting and warfare,qualities such as athletic ability, strength, skill in weapon use ,courage are significant whereas in peacemaking, qualities such as intelligence, good social skills, oratory skills, and ability to unify the group toward a common goal are of key importance.

Another quality which is often sought among leaders is fairness. Fairness in this context involves equity as well as equality. In this context, equality refers to distribution of rewards as a function of individual contribution to a group, that is, those who have contributed more to the group will get more rewards and vice versa. Equality on the other hand refers to equal distribution of rewards in the group, that is all members of the group will

receive equal rewards irrespective of their contribution. The services-for-prestige theory predicts which followers will want leaders who adopt each definition of fairness. Members with above average contributions will want leaders to value equity as they will gain more resources as a function of their contribution. On the contrary members with below average will favor equality since they will be getting equal share despite their low contribution.

Both leaders and followers benefit from this exchange hence The service-for-prestige theory is fundamentally based on reciprocal altruism.

8.4 EVOLUTIONARY THEORY OF SEX DIFFERENCES IN STATUS STRIVING

In the earlier unit, we have learned that there are differences in the obligatory parental investment made by both the genders. For males the obligatory parental investment in offspring is low as compared to females and hence the ceiling of reproduction is higher for males than females. The more polygynous the mating system, the stronger the selection pressure on the males to become one of the few who would succeed in reproduction.

Research evidence has shown that women often prefer men with high status as it ensures increased access to resources, better protection and support to children and healthcare.(Buss, 1994b; Hill & Hurtado, 1996). Dominant men often gain increased access to women through intrasexual domination (Puts, 2010). Dominant men might take the mates of subordinate men thereby leaving these low-ranking men helpless to retaliate. This way status and dominance help men to have increased sexual access and benefits.

8.4.1 Status and Sexual Opportunity:

Let's now understad if there is any association between status of men and the sexual oppotunity. Are there any research evidences which proves that elevated status in men ensures greater sexual opportunity with females?

An extensive research was conducted by Evolutionary anthropologist Laura Betzig. She gathered systematic data from the first six civilizations Mesopotamia, Egypt, Aztec Mexico, Incan Peru, imperial India, and imperial China namely (Betzig, 1993).These civilizations spanned four continents and roughly 4,000 years, beginning in about 4,000 b.c. All the six civilizations did show a remarkably consistent pattern. It was found that Status and rank, afforded men great sexual access to women in each of the six first recorded human civilizations.

In modern times as well the association between status and sexual opportunity appears to be strong. In some modern Western cultures monogamy is legally enforced as it restricts the number of women a man can marry. In modern society, men with high high status ensures greater sexual access to a larger number of women (Perusse, 1993). Another research finding reported that modern men with high income and status

found to have more frequent sex and a larger number of children (Hopcroft, 2006; Weeden, Abrams, Green, & Sabini, 2006). A research conducted in Austria documented that In the context of universities, high status male academicians had more children than the other employees which is also in line with the earlier findings. (Fieder et al., 2005).

In sum, we can say that evolutionary logic explains why do men stive for status more than women as High status in men ensures increased sexual access to a large number of women.

8.4.2 Are men higher in status striving:

Is there any difference in the amount of status striving as a function of sex? Let's have a look at what researchers have to offer about the same.

A study was conducted by involving six cultures showed that boys tended to involve more in rough-and-tumble play, assaults and other aggressive actions, tried to seek attention, and also issued dominance challenge to same age peers. Girls on the contrary found to use nurturance and pleasing sociability more than boys (Whiting and Edwards, 1988).

Psychologist Elenor Maccoby (1990), did extensive research to study sex differences in preschool years. She concluded that rough tough play characteristics and language seems to be important for boys as it protects an individual's turf whereas for girls conversation is more likely to be a binding process. She concluded that sex differences in dominance motivation occurs at a much early age. Those who are high on SDO (Social Dominance Orientation (SDO) legitimize one's group dominance over others. Men consistently score higher on SDO than do women. Findings cross culturally have supported this notion.

8.4.3 Men and Women Express Their Dominance through Different Actions:

Which acts can be described as the acts of dominance? Is the perception of dominance acts similar for men and women? Researchers have tried to explore the sex differences in the perception of dominance acts through various studies. In one study, researchers collected 100 acts of dominance (listed previously) and asked both men and women to rate each act on two grounds. One being the social desirability of the act and another was the extent to which the act was worthwhile in their eyes. It was found that for women, prosocial dominant acts were rated to be more socially desirable whereas for men egoistic dominance acts were rated as more socially desirable. Prosocial dominance acts involved statements such as "Taking charge of things at the committee meeting," "Taking a stand on an important issue without waiting to find out what others thought," "Soliciting funds for an important cause and egoistic dominance acts involved statements such as "Managing to get one's own way," "Flattering to get one's own way," "Complaining about having to do a favor for someone," and "Blaming others when things went wrong (Buss, 1981).

Do these sex differences reflect in the actual behaviors of men and women? Research findings reported that men in reality as well appear to perform more egoistic dominance acts whereas women appear to engage in prosocial egoistic acts.

Edwin Megargee (1969) conducted an experiment in which he administered a dominance scale to both men and women and selected those who scored either high or low. Participants were then put into pairs in such a way that in each pair there will be one high dominant player and one low dominant player. He made 4 conditions:

(1) A high-dominant man with a low-dominant man,

(2) A high-dominant woman with a low- dominant woman,

(3) A high-dominant man with a low-dominant woman, and

(4) A high-dominant woman with a low-dominant man.

Participants were provided with the necessary material and their task was to act as troubleshooters in a team and repair the boxes given by unscrewing nuts and bolts and replacing it with different colors. In the team they were told they had to choose the leader (providing instructions) and the follower (act as per the instruction by the leader). It was found that in same sex pairs, 75 percent of high dominant men and 70 percent of high dominant women took the leadership position. Interestingly, when high dominant men were paired with low dominant women, 90 percent men took leadership roles. Interestingly when a high dominance woman was paired with a low dominant man ,only 20 percent women took up charge of leadership positions.

On prima facie, we may believe that women tend to suppress their dominance or men are compelled to take leadership positions, however nothing is guaranteed. When the researcher analyzed the recording between pairs while deciding and assuming roles it was found that in 91 percent of the cases women made a final decision and were appointing low dominant partners to leadership positions which again proves that women tend to exercise their dominance differently than do men.

Another hypothesis involving sex difference in dominance and status proposed that men are more likely to use riskier resource strategies when being observed by others with similar status and not by people who are either low or high status to them.Elsa Ermer and her colleagues through an experiment confirmed the assumption that in males status competition gets more intense while involving men of equal status thereby increasing the use of riskier strategies. (Ermer, Cosmides, & Tooby, 2008).

8.5 DOMINANCE THEORY

Survival of any species is marked by conflict between those who are dominant and those who are trying to defeat those who are dominant. In such competition, survival will favor both dominant as well as submissive

or subordinate strategies to subvert the access of the dominant individual to key resources. Dominance theory further proposes that human beings have evolved a few strategies to reason about social norms involving dominance hierarchies such as obligation, permission and prohibition. And these strategies are domain specific.

Cummins supported the theory with a few research findings. Cumin believed that human reasoning emerges at a much earlier stage as young as three. Cumin further stated that individuals choose to use different reasoning strategies on the basis of whether one is evaluating deontic or indicative rules. Deontic reasoning refers to reasoning about what an individual is allowed, obligated and prohibited to do whereas indicative reasoning involves reasoning about what is true or false. It was found that when individuals evaluate deontic reasoning, they look for rule violations whereas when they tend to evaluate indicative rules they look for the evidence which conforms to the rule. For example, if the deontic reasoning states that" Drinking is permitted only after twenty one years of age", individuals will look for instance where the person might be drinking in spite of being under aged. Whereas in case of Indicative reasoning if the rule states that all polar bears have white fur, individuals will look for the instances which will conform to the rule (Cummins, 1998).

Dominance theory further states that ranking or status of an individual will have a strong influence on human reasoning. An experiment conducted by Mealey, Daood, &

Krage,(1996) empirically tested this assumption. Participants in this experiment were shown a few pictures of men along with their social status (high or low), Character(Trustworthiness, history of cheating) and biological information. After a week the participants were called to the laboratory and were asked to recollect which photographs they could remember. Findings revealed a few patterns. Participants remembered cheaters more than non-cheaters and this memory was enhanced if the cheaters were from low status and the same memory bias reduced if cheaters belonged to high status. Memory biases for cheaters were stronger for men than women. Another study conducted tested the effect of status on social reasoning and concluded that there existed a strong link between these two factors. (Cummins,1998).

8.6 SOCIAL ATTENTION HOLDING THEORY

Another theory explaining how the hierarchies are made in species was put forward by evolutionary psychologist Paul Gilbert (1990,2000a) .This theory emphasizes on the idea of Resource Holding Potential (RHP). RHP put another way is an assessment of one's own strength and weaknesses as compared to other animals. The dominance hierarchies, as per this theory emerges from this evaluation. Losers and those who determine that they are inferior will have low RHP, in contrast Winners and those who determine before the contest that they are likely to win will have superior RHP. According to the proposal of this theory, once the RHP evaluations

are made an individual might behave in one of three ways such as attack (High RHP), Flee (Low RHP) or submit.

Another principle that is highlighted in this theory is social attention-holding potential (SAHP). SAHP refers to the quality and quantity of attention provided to one individual. According to this theory hierarchies emerge from the amount of attention sought by an individual. Those who receive high quality and quantity of attention, will experience elevation in status and on the contrary those who are isolated and don't get attention will be low in status. People often bestow their attention to those who perform key functions that are valued by bestowers. For example, doctors who treat the needy.

This theory also emphasizes the emotional components of dominance (Gilbert (1990, 2000a). The theory predicts that increase in rank is associated with elevations in mood and helpful behavior.

According to SAHP theory, Decrease in status leads to different consequences for mood and emotion as it results in social anxiety, shame, rage, envy and depression.

8.7 INDICATORS OF DOMINANCE

High dominance and status can also be indicated by a variety of verbal and non-verbal characteristics. In this section we would explore the association between verbal and non-verbal characteristics with dominance. However, it is important to note that correlation does not guarantee causation.

1) Verbal and Nonverbal Indicators of Dominance:

Literature has shown that there are significant differences in the physical posture between dominant and non-dominant people. Dominant individuals tend to stand at full height, often facing the group, with hands on hips and an expanded chest whereas less dominant or non-dominant individuals are exactly the opposite and their body posture is often bent rather than straight. With respect to their verbal and non-verbal behavior, Dominant individuals generally gaze a lot, look at others while talking, do not smile much and speak in a loud and a low pitched voice and gesture by pointing whereas individuals with low dominance speak softly, smile a lot, listen while other is speaking and generally keep less than those higher in status.(Argyle 1994, Ketelaar et al., 2012). Literature further suggested that In men, walking speed is linked with socioeconomic status, linking it with evolutionary activities such as hunting.

2) Size and Dominance :

Ethnographic studies involving different cultures have made frequent references to a term ‘big man’ which indeed reflects the importance of physical stature, influence, dominance, power and authority. Research involving diverse cultures establishes a link between Height and dominance. Across cultures it has been found that people prefer their

leaders to be tall and those who are tall tend to show greater interest in assuming leadership roles than do short people (Murray & Schmitz, 2011).

Experiments were also conducted to test if there is any link between physical and social stature (Wilson,1968).In one study it was found that audiences described the man as being tall or not based on the rank assigned to the individual such as professor, graduate student.

Is there any practical advantage that people get because they are tall over short people? Research shows that tall men are more likely to get an advantage in being hired, promoted, and elected (Gillis, 1982)

3) Testosterone and Dominance:

Testosterone (T) is one of the important hormones that contributes to developing and maintaining "masculine" features in a variety of animals (Mazur, 2005). The production of Testosterone increases significantly at puberty which brings about the key changes associated with puberty such as deepening of voice, facial and bodily hair, penis growth, and an increased interest in sex. Researchers tried to experimentally manipulate the levels of Testosterone in cows and found that those cows tested with T rose to higher rank and when T was removed they sank to the previous rank.(Bouissou, 1978).

In the case of humans, studies show that higher levels of Testosterone are linked with significant antisocial domains and antisocial acts typically in young males.(Mazur, 2005). The mismatch hypothesis further predicts that if there is a mismatch between the levels of T and the status,(High T & Low status / Low T & High status) people will experience stress and may distort their cognitive performance (Josephs, Sellers, Newman, & Mehta, 2006). Mazur (2005) Further stated that changes in status also brings about changes in T. No wonder why winners show elevated in T levels whereas losers show decrease in T after a competition. This finding is not only limited to athletic competitions but also to the competitions involving reaction time and chess (Mazur, Booth, & Dabbs, 1992). Elevated T levels in winners may prepare them for future challenges and may discourage losers from future confrontations.

Studies have also explored the link between WHR (Waist to Hip ratio) in men to T and dominance and found that men with high WHR ,with high T levels are found to have less physical problems.(Singh, 2000).Another research finding shows that T is positively correlated with dominance and not prestige. Most of the research conducted so far in this domain has explored the relationship between T and social status and dominance in males and not females. Since the data is limited Further research is needed to clarify the links between T and status in women (Grant, 2005).

4) Serotonin and Dominance:

Researchers have also tried to explore the links between serotonin and status. Range of experiments have been conducted involving both human and nonhuman species and concluded that serotonin indeed is associated

with dominance and higher ranks. Evolutionary scientists Michael McGuire and Michael Raleigh through a series of experiments with monkeys reported that the amount of serotonin in monkeys varied as a function of their social status, monkeys being higher in status having almost twice the level of serotonin than monkeys with lower status.(McGuire & Troisi,1998). In the case of human beings too it was found that serotonin indeed is linked with dominance and status as officers' serotonin levels were considerably higher than the regular members. Interestingly ,a similar pattern was found when researchers analyzed their own levels of serotonin and found that the serotonin leve;ls in case of lab director were greater than research assistant.

So far we have reviewed only a few factors that are associated with status and dominance, however other correlates of dominance and status need to be further analyzed and studied in order to form a comprehensive theory of determinants of dominance and status.

8.8 SELF ESTEEM AS A STATUS TRACKING MECHANISM

Researchers have explored the concept of self-esteem in context of prestige, power and status with reference to one's referent group.

8.8.1 Sociometer theory:

Why do human beings form different groups and choose to stay in the group? Why is group membership so important for an individual? Why do people look for or strive for acceptance by group? Evolutionary logic explains that human beings started living in groups as it offered key resources, protection which was critical to one's survival and reproduction. Group acceptance is important to enjoy these benefits and failure to gain acceptance would lead to isolation and loss of protection hence group membership and acceptance has been long favored by human beings. By this logic, as group acceptance is key to survival and reproduction, we must have evolved some mechanisms through which we may track the level of one's acceptance in society.

Sociometer theory states that Self Esteem is one such indicator which helps people measure one's acceptance in groups. As put by Barkow (1989) self-esteem tracks dimensions of prestige, power, and status within one's referent group. As per the arguments of sociometer theory self-esteem reflects other people's evaluation about self. An increase in self-esteem reflects an increase in the degree to which one is socially accepted by others and vice versa.(Baumeister & Leary, 1995; Leary, Haupt, Strausser, & Chokel, 1998) A range of studies have empirically tested the arguments and have gained support for the theory.

According to the expanded Sociometer theory, self-esteem also serves a few evolutionary functions. First, Self-esteem serves as a motivator to design one's actions in such a way that gains respect from others, as it is linked with status and reputation. Secondly, accurate evaluation of self-

esteem helps an individual to understand one's position in social hierarchy and then to manage their strategies (challenge or submit) accordingly. Third function of self-esteem helps an individual in gauging one's desirability in the mating domain.

In an interesting study, The researchers analyzed self-evaluation of both male and female participants on the dimension of self-desirability as a marriage partner. These evaluations were taken after exposing them to the photographs of same sex other who were either dominant or less dominant and physically attractive or less attractive. Findings of the experiment revealed that physical attractiveness of same sex other considerably impacted women participant's self-evaluation but not the evaluations of male participants. On the contrary, dominance of same sex other had considerable impact on the self-evaluation of male participants but not of female participants.(Gutierres, Kenrick, & Partch, 1994).However more research is needed to form a comprehensive theory.

8.9 STRATEGIES OF SUBMISSIVENESS

Not all people stand at the high end of dominance or not all people stand high in their status. Not all people in a group situation assume the leadership role. Much research has focused upon exploring the domain of high status and dominance but what about the other end of the continuum? In this section we would explore the domain of being submissive and strategies used by those who are submissive in nature.

8.9.1 Sex Differences in Submissive Strategies:

Though this domain has received less research attention, evidences suggest that there is a difference as a function of sex in the tactics and strategies employed by men and women while negotiating with powerful men. In this section we shall discuss some of the commonly used strategies by both the sexes.

1) Deceiving Down:

Consider two situations: A man who is doing a job that does not fully take advantage of his talent or a woman who believes that she is more intelligent than her husband.(Hartung,1987).

By evolutionary logic this may pose an adaptive problem as the superior might fire the employee for insubordination and in case of the other example the spouse might seek someone with whom he is more comfortable. Adaptive solution to this problem comes in the form of a strategy of deceiving. Deceiving down should not be misunderstood as playing dumb. It refers to actual reduction in the self-confidence to act in a subordinate or submissive manner. Evolutionary literature shows that when such situations existed it was always adaptive to act as submissive thereby being non-threatening and avoiding further wrath and conflict. However further research is needed to explore consequences of deceiving down , if any, on self-esteem.

2) The Downfall of "Tall Poppies":

Have you seen people taking delight in someone else's misfortune? Do you think that having a great status attracts envious notice or hostility from others? As defined by Oxford English Dictionary "Tall poppy" refers to "an especially well-paid, privileged, or distinguished person" (Simpson & Weiner, 1989) Another definition comes from The Australian National Dictionary Tall poppy refers to "a person who is conspicuously successful" and "one whose distinction, rank, or wealth attracts envious notice or hostility" (Ramson, 1988).A rough translation of English would be having pleasure in someone else's misfortune.

Feather et al conducted an experiment involving people from Japan and Australia and analyzed people's reaction towards the fall of tall poppies. For example, an academic Superstar might plunge in performance on a critical final exam. Researchers asked participants to read such scenarios which varied on certain features such as whether the fall was small or large, cause of fall to be the mistake by a poppy and whether the person's initial success was deserved. Tall poppy scale served as one of a dependent measure and it included statements such as "It's good to see very successful people fail occasionally," "Very successful people often get too big for their boots" etc. Findings revealed that people reported more happiness by the fall of tall poppies when the high status of the person was made salient. Participants' reaction varied as a function of their belief about if the tall poppy deserves the success. Lastly, Envy was commonly experienced emotion particularly if the domain of success is what people valued. Self-esteem too played a role as participants with low self-esteem had more formed more favorable reactions to the fall of tall poppies. It was also found that cultural differences in the pattern of reaction was found as Japanese participants reacted more favorably to the fall of tall poppies than the Australian participants. The findings suggest that facilitating the fall of people with greater status and taking delight in their fall are used as submissive strategies. One's success is always taken as relative to others hence one way to achieve the same is by self enhancement and another is by promoting the downfall of others, interestingly people tend to use both.

Further researchers tried to explore under what conditions people might use submissive strategies. Studies suggest that social comparison plays a key role in activating submissive strategies. (Buunk & Brenninkmeyer, 2000). In addition to the strategies discussed above human beings have long used tactics such as including creating greater distance from the dominant individual, hiding, escaping, remaining passive, signaling defeat, eliciting help from others, and signaling agreeable and cooperative proclivities (Fournier, Moskowitz, & Zuroff, 2002; Gilbert, 2000a, 2000b). Human beings may also use conformity to avoid being stigmatized and ostracized (Kurzban & Leary, 2001; Williams, Cheung, & Choi, 2000).

8.10 COGNITIVE DEVELOPMENT

We often study psychological mechanisms in the context of information processing devices which are made specific to solve adaptive problems. As adaptive problems are typically social in nature, Cognitive psychology must consider the ways in which human beings understand and process information while dealing with other people. Literature helps us understand that some core assumptions of cognitive psychology are challenged by evolutionary psychology (Cosmides & Tooby, 1994).

Cognitive Psychologists assume that cognitive architecture is a general purpose mechanism and content free, whereas evolutionary psychologists take an opposite stand and state that the mind involves specialized mechanisms for solving specific adaptive problems. Secondly, for the sake of ease of presentation and experimental manipulability, cognitive experimental psychology mainly involves material like triangles, shapes or a few circles, nonsense syllables as opposed to kin, enemies, mates. According to evolutionary perspective, assuming mind as a general mechanism is problematic as successful adaptive qualities will be different for one domain than the other.

Cognitive Psychology further believes that information-processing mechanisms can be studied without considering the adaptive problems they were designed to solve, a view typically known as functional agnosticism. On the contrary evolutionary psychology states that, it is impossible to understand how human beings act, processes take decisions without understanding the functions of cognitive mechanisms performing these activities. Replacing the core assumptions, evolutionary psychology permits the integration with other life sciences (Tooby & Cosmides, 1992).

1) Attention and Memory:

As indicated by researchers, Attention and Memory are valuable yet limited resources, hence are highly selective (Klein, Cosmides, Tooby, & Chance, 2002).

It has been indicated that human memory and attention is extremely sensitive to store and retrieve information highly specific to solve adaptive problems (Klein, Cosmides, Tooby, & Chance, 2002). One of the researchers made use of eye-tracking technology and found that women were more likely and strongly responded with attentional bias toward viewing infants than men (Cardenas, Harris, & Becker, 2013), which proves that evolutionary relevance influences attention (Jackson & Calvillo, 2012). Evolutionary psychologists assumed the memory systems to be somewhat domain specific for survival and reproduction. The researchers used a standard memory experiment paradigm and made participants participate in a surprise recall test and it was found that those words rated relevant for survival were remembered better than words rated for relevance in a variety of control scenario conditions.(Nairne & Pandeirada, 2008, p.242; see also Nairne et al., 2012).

2) Problem solving, Heuristics ,Judgment under uncertainty:

Cognitive Researchers have indicated that Human beings are more likely to make errors when solving problems and making decisions under conditions of uncertainty (Nisbett & Ross, 1980; Tversky & Kahneman, 1974).It further shows that human beings are predisposed to certain type of biases and errors; Base rate, Conjunction fallacy to name a few. Base rate fallacy indicates that humans are more likely to ignore actual statistical information when presented with compelling individuating information. Evolutionary perspective poses a challenge to specific cognitive view that problem solving capacities of human beings are subjected to certain errors and biases (Cummins & Allen, 1998).As per the notion of evolutionary psychology, designing experiments which are more close to the setting in which human beings learn to solve the adaptive problem would paint a different picture of cognitive capacities of humans under the uncertain situations. However it is not implied that the human mind is completely free from biases, rather certain biases are adaptive in nature that solve the problem of survival.

3) Language:

As stated by Pinker ,"Simply by making noises with our mouths, we can reliably cause precise new combinations of ideas to arise in each other's minds".The two primary questions which are discussed in evolutionary context are as follows: Is language an adaptation and if yes what adaptive problems did it solve?

Noam Chomsky and Stephen Jay Gould have argued that language is a by-product of the tremendous growth of the human brain rather than an adaptation.As per these researchers many functions emerged as a side effect of brain growth.However they eased their positions and allowed the possibility that human language could have been guided by particular selective pressures which are unique to our evolutionary past, or a consequence (by-product) of other kinds of neural organization" (Hauser, Chomsky, & Fitch, 2002).

On the contrary evolutionary psychologist Steven Pinker strongly argues that language is an adaptation. According to him language involves universal elements found across all the languages such as verb, proposition, temporal distribution of events (past ,present, future). He further stated that children usually by the age of three, without much formal training masters the complex structure of language. Language is also linked to specific brain areas and any damage to these areas results in certain impairments. All these support the notion that language is an adaptation. Pinker further argued that language is evolved to facilitate communication which necessarily involves the exchange of information between individuals which is used to convey a variety of information such as possible threat, coordinating for coalition in context of war or hunt, coordinating construction of shelter etc. (Pinker, 1994).Though there are a few competing theories, the dominant theory of information communication cannot be dismissed (Pinker & Jackendoff, 2005).

4) Human Intelligence:

As put by Leonard & Robertson,1994, "Although the human brain makes up only 2 to 3 percent of the average human's body weight, it consumes roughly 20 to 25 percent of the body's calories". Human beings have a larger brain relative to body size. Human brain houses unprecedented capacities for abstract thinking, reasoning, learning, and scenario-building. There has been a great debate as to why human beings evolved these cognitive capacities. According to the ecological dominance/social competition (EDSC) hypothesis, human ancestors could defeat many of the traditional "hostile forces of nature" such as food shortages, warfare, pestilence, and extreme weather. that previously impeded survival. According to the EDSC hypothesis, human dominance over the ecology paved the way for a new set of selective forces, namely competition from other humans .Living in a large multifaceted social group demands certain adaptive problems to be solved such as forming coalitions, punishing cheaters, detecting deception, and negotiating complex and changing social hierarchies.

8.11 MODULARITY OF MIND AND INNATENESS ISSUES

The idea of modularity of mind emerged somewhat unclearly in the literature of psychology in 1980's following Fodor's landmark book The Modularity of Mind (1983). Fodor has focused on nine characteristics or features of modularity and they are as follows: Modular systems are localized, Subject to characteristic breakdowns, mandatory, fast, shallow, Ontogenetically determined, domain specific, inaccessible, subjected to breakdown, informationally encapsulated. The Moderate modularity hypothesis has two parts. The first part states that certain input systems involved in language and perception are modular whereas systems involved in belief fixation and modular reasoning are not modular. Input systems can be thought of as a computational mechanism which "presents the world to thought" by processing the outputs of sensory transducers. A sensory transducer can be understood as a device which converts the energy impinging on the body's sensory surfaces, into a computationally usable form.It does so without adding or subtracting information for example retina or cochlea. The idea of modularity of input systems has been criticized and opposed by many psychologists (Churchland, 1988; Arbib, 1987; Marslen-Wilson & Tyler, 1987; McCauley & Henrich, 2006). Fodor in his claim further states that certain systems cannot be understood as informationally encapsulated hence central systems are not modular.

Evolutionary psychology argues that the human mind involves a set of cognitive adaptations which are mainly designed by the natural selection process. From an Evolutionary perspective as put by, Tooby and Cosmides (1992) the better analogy for the human mind is not that of a general all-purpose computer, but rather a Swiss army knife.

Evolutionary Psychology states that the mind is not a logic device but a specialized mechanism evolved to deal with specific or certain forms of adaptive problem. For example, to understand how fear responses are learned in monkeys, Mineka et al, conducted a series of experiments on rhesus monkeys. It was observed that those rhesus monkeys raised in captivity showed no evidence of fear to snakes however monkeys captured in wiled did show the evidence of fear and panic even to a toy or a rubber snake. Further it was found that naive lab raised monkeys developed the fear of snakes following exposure to motion films in which wild captive monkeys were shown reacting fearfully to snakes. Studies by Mundkur (1978) have also shown the universal tendency among human beings to attribute symbolic significance to certain animal species. Cooke (1996) further argued that this phenomenon is known as evolution of interest which makes certain stimuli more intrinsically interesting to us than others. He showed that even if the countries have an environment that is free from snakes, presence of serpents is found in art and motifs and sculptures. From this it is evident that fear learning is an evolved psychological mechanism. Cosmides and tooby further studied people's ability to reason logically using a Wason Selection task in the context of social situations. It was observed that participants performed better in the social context as food ,drink, cheat detection. Tooby and Cosmides argued that we have evolved a special propensities for dealing with problems involving social contract by activating a cheat detection mechanism.

Evolutionary account of human cognition focuses on innate psychological mechanisms. It is important to understand what purpose various cognitive capacities serve or for what purpose different cognitive capacities have evolved? Mind can be seen as a unit consisting of different independent modules to deal with various environmental pressures.

As put by Steven Pinker, The human mind is not a general purpose computer but a collection of instincts adapted for solving evolutionary significant problems.Evolution refers to change over time. Darwin argued for the notion “struggle for existence,” in which favorable variations tend to be preserved and unfavorable ones tend to die out.

Common Misunderstandings in the field of evolutionary Psychology are as follows :

1. Human Behavior Is Genetically Determined Evolutionary theory represents a view that focuses on both evolved adaptations and environmental input.

2. If it is evolutionary, we can't change it evolutionary theory does not imply that human behavior is impervious to change.

3. Current Mechanisms Are Optimally Designed.

8.12 SUMMARY

In this unit we began by discussing how status hierarchies are formed in non-human species. Then we discussed what functions do these

hierarchies serve and how they help to solve adaptive problems of survival and reproduction. In the later section, we tried exploring the theoretical perspective underlying dominance, status and prestige. We discussed the following question: Why do people strive for prestige? We then discussed dominance hierarchy theory which argued that some individuals will have greater access to the key resources critical for survival and reproduction. Dominance and Social Holding potential theory was also discussed. The other end of the Dominance continuum namely submissiveness and the sex differences in the strategies used by male and female also explored. We concluded our chapter with the discussion of cognitive development and modularity of mind in brief.

8.13 QUESTIONS

A) Write long answers:

a) Discuss how hierarchies are formed and explain dominance theory in detail.

b) Elaborate evolutionary theory of sex differences in status and prestige in detail.

c) Write a note on submissiveness strategies used by men and women.

B) Write short notes:

a) Indicators of Dominance

b) Cognitive Development

c) Dominance and Status in Non Human Species

d) Self Esteem as status tracking mechanism

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