

# Ecological Principle of r and k Selection Model and Socio-biological Aspect of Human Development

## Abstract

Since the inception of human civilizations, human welfare had been central to The understanding of all scientific endeavors and ecological science is no exception. It becomes highly interesting when pure ecological paradigms are applied to the human life and behavior. This becomes imperative because *Homo sapiens sapiens* (human) is the only species on this planet which has largely modified ecological phenomena. Quality of life is becoming a very popular concept and cornerstone of human development and defined by subjective measures, such as life satisfaction, happiness or subjective well-being scales, and objective ones, such as the Human Development Index or the Physical Quality of Life Index.

**Keywords:** r and k Selection, Human Development, natural selection, Ecology

## Introduction

Fundamentally, ecological science is founded on the theory of evolution by natural selection and living organisms exist because they have been selected for their capacity to survive and reproduce. This aspect can be connoted by the principle of the survival of the fittest. In present-day evolutionary theory, fitness is no longer defined as intrinsic robustness or adaptation to the environment but as the average success rate of long term reproduction. The logic of natural selection is simply that the variants with a lower fitness will lose the competition with the others, and eventually disappear. Thus, evolution constantly tries to maximize fitness.

According to Darwinian theory, fitness is central and the true meaning of life i.e. the fundamental goal that all living organisms implicitly try to achieve, the property that characterizes them as living, and the original reason for which they have come into being.

## Review of Literature

This concept is based on the observation that ecological conditions favour certain life-history strategies and thereby a whole set of physiological traits such as hormonal, metabolic and immunological traits. Populations or species living in resource-limited environments should have lower metabolic rates and a slower pace of life, i.e. later maturation, fewer offspring of higher quality and a longer lifespan, compared to species living in richer environments. Correlational selection is a potential mechanism leading to this functional integration among multiple phenotypic traits. The study of Chisholm, J. S. (1993, 1999), Gunnar M. (1998), Heylighen F. & Bernheim J. (2000), Gibson M A Gurmue, (2011). Goodman A Koupill Lawson D W. (2012) and Royauté *et al.* 2018 have described the Ecological Principle of r and k selection model and Sociobiological aspect of Human Development.

## Principle of R and K Model

The two evolutionary "strategies" are termed r-selection, for those species that produce many "cheap" offspring and live in unstable environments and K-selection for those species that produce few "expensive" offspring and live in stable environments intricately related to survival and fitness of the organisms. The choice between an r and k strategy does not need to be wholly fixed in the genes but can also be epigenetically shaped by early experience and nurture. Indeed, since the environment changes in carrying capacity and degree of risk or unpredictability over the generations, it is useful for an organism to be able to adapt its strategy to the current situation. This may apply in particular to



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humans, who excel in adaptability. Such epigenetic biological effects may be mediated by hormones, whose levels are dependent on experience.

r-selected Species	k-selected Species
Live unstable environment, density independent	Live in Stable environment, density dependent interactions
Small size of organisms	Large size of organism
Each individual reproduces only once and many offspring are produced	Few offspring are produced individuals can reproduce more than once in their lifetime
Energy used to make each individual is low	Energy used to make each individual is high and high energy cost of maintenance
Short life expectancy	Long life expectancy
Type III survivorship pattern in which most of the individuals die within a short time but a few live much longer	Type I or II survivorship pattern in which most individuals live to near the maximum life span

**r-selected approach**

An r-selected approach to reproduction emphasizes producing large numbers of offspring with minimal care given to each offspring by its parents but on the other hand in K—selection approach few offspring are produced but maximal parental care is taken to insure survival of offsprings. It has been found serious victimful criminal behavior (i.e., serious violent and property offenses) in numerous countries are predictable by hypothesizing that criminal behavior can be explained by r-selected approach and r-strategies are adopted in dangerous, uncontrollable environment where there is few chances of surviving into adulthood. Under the hard and unfavorable environment creates stress which leads to the release of glucocorticoid hormones, such as cortisol. So, the children who are subjected to chronically high levels of such stress hormones will tend to develop into r strategists. This leads to early sexual maturity, a strong sexdrive, a tendency towards aggressively and risk-taking in men, and high fertility in women. On the other hand, high levels of sex hormones are associated with higher chances of heart diseases and cancer, resulting in to shorter life expectancy.

In the present article, it has been emphasized there are several evidences which lead to a functional hypothesis that stressful environments during childhood tend to lead to r-type behaviors throughout life. Primary cause of childhood stress is insecure attachment to the mother and such motherly neglect or over concern is stressful in itself, it moreover is likely to indicate a dangerous external environment is responsible for adopting the r-selected life style. Lack of attention to the child may also mean that the mother has too many other children to care for, which is itself a sign of an r-type situation.

Thus, insecure attachment, through its stimulation of stress hormones, is a very strong indication for the child that it is growing up in an environment where an r-strategy is evolutionarily most appropriate.

**K r-Selected Approach**

The favorable life situations leads to development of k-selected life approach resulting in high life expectancy and low infant mortality are defining features of a K but will indirectly contribute to the appearance of the pattern, as they indicate a more secure environment in which people and children in

particular run less risk to die or to lose their parents or other family members. However, the hard situations like lethal accidents, murders and war are all important risk factors that negatively affect K-behavior and K-behavior will in turn reduce these risk factors, since it will promote less risk-taking behavior. The people who are wealthy enough who have inadequate nutrition, poor housing, lack of medical care, etc., but once these basic necessities are reliably available, further wealth seems to add little to quality-of-life. K -behavior in turn may increase wealth, by stimulating long-term investment.

**Conclusion**

In the light of above discussion it is obvious choice of the life strategy is decided by the social and economic situations of childhood. The pleasant and hard environmental conditions controls the hormonal release of which ultimately governs human behavior. This is a small but sincere endeavor to relate Socio-biology to science of ecology and it could prove an important aspect to study the socio-biological aspect of human development.

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