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# The Frequency Distribution Analysis of Biological Data to Detect the Regulatory Status of Organisms

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**Abstract:** The state of the human regulatory systems, especially the autonomic nervous system, is of great importance for health. Stress in the sense of distress, which leads to rigidity, is just as unhealthy as chaos in the regulations. In humans, we can easily determine the current state with the frequency distribution analysis of the heart rate variability (HRV). Identical distances of the heartbeats (rigidity) include the risk of sclerosis and myocardial infarction, a large variability of the distances (arrhythmia = chaos) can lead to embolisms. We can distinguish five states of regulation: disorder, health and order are variations within the physiology, chaos and rigidity are pathological. The investigation can be carried out with the help of the chi-square analysis by approximation to the Bell's curve (randomness, chaos) and the lognormal distribution (order) inside the Poincare plot. It is not the mean value that represents health, but the golden ratio. This applies not only to the organism, but to all regulated systems, including society. From this, one can see what changes in attitudes and behaviors should be done in order to ensure a healthier life.

**Keywords:** System Analysis, Frequency Distribution Analysis, Regulation, Biological Systems, Biological Data Regulation

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## 1. Introduction

Chemical drugs have side effects. This is even considered proof of their effectiveness. Unfortunately, the main effects are not always achieved, they are at the level of suppression of symptoms. Cooperation with self-healing forces is rarely achieved. A large part of chemical therapeutics works against the body's own functions, e.g. -blockers, -antagonists. This is based on the view that there is no sense in the disease, that the organism is making a mistake and it is necessary to prevent it from doing what the body is trying to do with the disease.

This view is based on the opinion that the organism has no inherent intelligence and that it must be prevented from processes that it has initiated itself. In contrast to this is the view of naturopathy that the body does not do anything senseless, that it works teleologically, i.e. directed towards a goal.

Often an apparent purposefulness of natural organisms, structures and systems for the layman is explained with natural adaptations or with an organization-conditioned self-regulation [1]. Colin S. Pittendrigh introduced the concept of teleonomy in 1958 in order to attribute apparent functionalities to automatically running programs. The term self-regulation

generally refers to processes in which a system self-adjusts its function. This can happen in order to maintain a function or to adapt the system to new conditions [2].

In contrast to control, the term regulation describes systems that are capable of learning, that adapt to changing conditions through feedback, and that are able to reach their (self-set) goal despite so-called disturbances (target-actual deviations) [3].

The basic idea of self-regulation originates from biology and is considered a fundamental functional principle of living organisms. It takes place continuously in the physiology of the human and animal body, for example, mostly when static conditions change and unnoticed by us.

Examples of self-regulations are:

- 1) Increase in blood pressure and heart rate when changing from lying to standing position.
- 2) Increased respiration during physical exertion to supply more oxygen to the body.
- 3) In hypoglycemia (low blood glucose), the body enacts drastic self-regulatory mechanisms (e.g., release of adrenaline, resulting in tremors and profuse sweating) to maintain glucose concentration and prevent impending hypoglycemic shock.

## 2. Feedbacks

In medicine, this is often referred to as autoregulation. This mostly concerns more local feedback mechanisms. In particular, blood flow to organs is often strongly dependent on self-regulatory processes.

The common denominator of models of self-regulation in psychology is that people are able to control their own behavior with regard to self-imposed goals. [4] It is undoubted that the organism strives for a state of dynamic equilibrium, homeostasis.

Homeostasis (ancient Greek *ὁμοιοστάσις* *homoiostásis*) refers to a state of equilibrium of an open dynamic system that is maintained by an internal regulating process. It is thus a special case of self-regulation of systems. The concept of homeostasis was described around 1860 by physiologist Claude Bernard, and the term and its name were coined in 1929 and 1932 by Walter Cannon, who intended it to express how the human body regulated itself in the face of disease or outside interference, and by Karl Ludwig von Bertalanffy. [1, 2]. In the human being as a multiform system, changeable by many influences, it seems to make sense to use the term homeodynamics to deal with the problem of a non-existent uniformity.

## 3. History

Many people think that health goes hand in hand with stability without variations. This is wrong. People were programmed vegetatively in prehistoric times and the Stone Age, when dangers lurked from everywhere. The people of that time had to be constantly on their guard, e.g. before the famous saber tooth tiger. There were two possible reactions to such a stressor: activation of the sympathetic nerve = fight or activation of the vagus nerve = death reflex. Those who

could not decide had lost anyway.

Nowadays, such acute stress situations are rare, but most people suffer from chronic stress = disstress. The objective situation is less important than the subjective perception I have of it. If I live and work under pressure, without the freedom of decision to be able to say no, or if I even imagine this pressure, then it is a pathogenic disstress. If I regard everything as a hobby for me, since I don't have to do it, it is a healthy eustress.

So what is health from these points of view? It is the regulatory-variable middle between sympathetic and vagus tonus. This does not mean that it is a rigid or even stable state, but it is accompanied by a lability ready to react at any time. Here, the physiological excursions from the center are order (increased sympathetic nervous system) and disorder (increased vagus). The middle of the vegetative system is thus a "dance" between two states, which can be called "orderly disorder" and "disorderly order" respectively.

Those who move within these ranges of variation are and remain healthy in the long run. However, this does not apply to the oversteps, namely when order becomes rigidity and disorder becomes chaos. These exaggerations immediately lead to diseases of the regulated systems of the organism. Such systems are: Psyche, immune system, nervous system, endocrine system, cardiovascular system, digestive system, metabolic system, musculoskeletal system, detoxification system, etc.

So what are chaos diseases? The most important ones are: Allergies, autoaggressions, arrhythmias burn-out, and adenocarcinomas. Which are rigidity diseases? The most important ones are: Arteriosclerosis and brain diseases like Alzheimer's and Parkinson's diseases. Looking at the causes of death, we find that over 90% are caused by the diseases listed here. Figure 1 demonstrates this system analysis.

### Synthesis/health

balance, polarity, rhythm, evolution, real life

#### thesis

order, structure, linearity, stability, Yang  
sympathicus

#### extreme 1

disstress, rigidity (e.g. sclerosis)

#### antithesis

disorder, contents, creativity, lability, Yin  
parasympathicus

#### extreme 2

chaos (e.g. arrhythmia)

Figure 1. System analysis of the regulatory states.

## 4. Investigations

The question now is how to investigate and recognize these conditions. The solution is the frequency distribution analysis of biological data. A simple method is the measurement of skin resistances to electric current (Ohm) [4-6]. More differentiated and informative is the heart rate variability (HRV).

One measures the intervals of the heartbeats in milliseconds over a few minutes with the ECG or a pulse wave recording. The distribution of the intervals allows an analysis of which intervals occurred how often. A narrow distribution corresponds to rigidity, a wide distribution to chaos. In between is the norm, the health [7].

Usually, one would have to assume that the norm is the algebraic or the geometric mean. However, this is not so, because the health corresponds to the Golden Ratio [6].

## 5. The Golden Ratio

The question arises what the Golden Ratio actually means. It is the simplest of all infinite continued fractions, its elements are all = 1. Thus, it not only provides harmony and aesthetics as seen in painting, architecture and music, but represents the mathematical equation on which the universe as a whole is built [8-11].

The reason lies in the fact that nature - on the earth as well as on the cosmic scale - works according to the principle of energetic economy (greatest possible effect with minimum effort). And this is guaranteed by the energy level of the Golden Ratio, which represents the laser threshold with deterministic-iterated chaos of non-linear dissipative structures or a labile-dynamic equilibrium. Risk and chances are equally distributed here, whereas the lability contains a (too?) high risk and the stability (too?) low chances.

## 6. Polarities

Table 1 shows the polarities in our life/world.

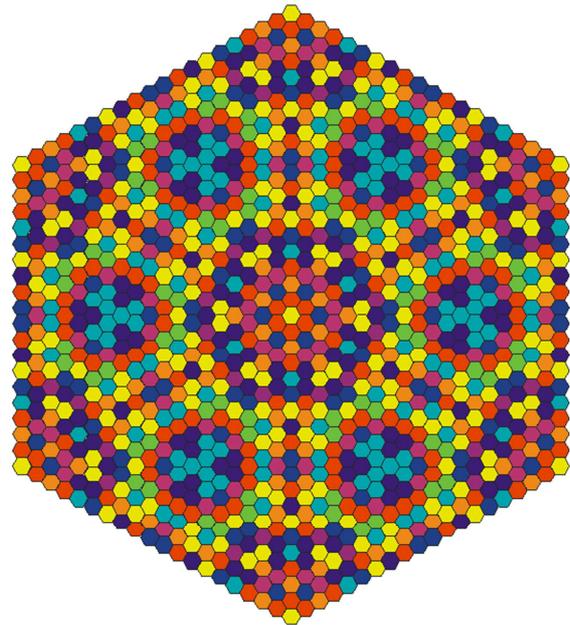
Table 1. Polarities in our life.

Polarities in our life:		
lability	vs	stability
complexity	vs	simplicity
non-linearity	vs	linear causal relations
responsiveness	vs	security
flexibility	vs	stubbornness
creativity	vs	orthodoxy
openness	vs	fanaticism
tolerance	vs	fundamentalism
Fuzzy Logic	vs	Euclidean predictability
hope	vs	expectation
non-identification	vs	identification
letting go	vs	binding
Dao spirituality	vs	law religions

## 7. Conclusion

It is easy to see that humanity and human health suffer from the fact that polarities have become opposites, antagonisms. The order of the universe inherent in the apparent disorder, as well as of the organism, would make possible a healthy and promising life. The extremes affect everything. Every person could undergo the simple and short examination of the regulation status by means of the heart rate variability (HRV) and thus recognize where he stands and what he should change.

The investigation can be carried out with the help of the chi-square analysis by approximation to the Bell's curve (randomness, chaos) and the lognormal distribution (order) inside the Poincare plot [12-15]. It is mostly a matter of inner attitude that leads us down wrong paths. We can change these. There is a close relationship between the Golden Ratio and Fibonacci's series of numbers. Since the latter can be converted into colors via numbers, one can thus create a mosaic of great beauty and also healing power (Figure 2).



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Figure 2. A mosaic pattern according to the Fibonacci series/Golden Ratio, applicable for healings.

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