

*Biological, Psychological and Social Bases of Health and Behavior*

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***Holism, General Systems Theory and the Biopsychosocial Model***

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## **Overview**

The following script explains how holism and General Systems Theory (GST) contributed to the development of the biopsychosocial model. The chosen topic to illustrate the relevance for a holistic perspective is the phenomenon of pain. The shortcomings of a reductionist approach to pain are elaborated upon.

### **1. Philosophically Contradicting Concepts: Holism versus Reductionism**

One of the earliest formulations of a holistic point of view had been formulated by the German philosopher Georg Friedrich Hegel (1770-1831) who stated on the nature of systems that the whole is more than the sum of its parts, that 'the whole defines the nature of the parts and parts are dynamically interrelated or interdependent' (Skyttner, 2001). Methodological holism states that complex and open systems are best understood on the level of principles governing the behavior of the whole system, versus methodological reductionism which seeks to understand complex systems through the structure and behavior of its most basic parts (Stanford, 2012). In philosophy, higher-level phenomena, novel properties, which cannot be reductively explained by lower-level domains are called '*supervenience*' (Savellos & Yalcin, 1995), e.g., the self-repair mechanism of the DNA cannot be entirely explained by underlying molecular laws or mind-states cannot be reduced to neurological states. For the domain of complex living systems scientists seek new models to explain the supervening qualities of higher-order domains. Medical reductionism by contrast states that illness and health are solely explained by their underlying physiological, bodily processes.

### **2. Holism , GST and their Contributions to the Biopsychosocial Model**

Biologists Paul Alfred Weiss (1898 - 1989) and Ludwig von Bertalanffy (1901-1972) knew each other personally and they developed a 'Systems Theory of Life'. Both strived to overcome a mechanistic model of biology in the 1920's. Weiss' experiments with butterflies concluded that biological phenomena need to be understood on system level and cannot be

explained by sole descriptions on component level. Bertalanffy coined the term of an 'Open System' stating that biology cannot be reduced causally to chemistry and physics. '*Ganzheit*' (wholeness) is a central motif throughout his work, voicing out the idea that specific system laws appear on each level of reality (Drack, Apfalter & Pouvreau, 2007). For the biopsychosocial model this means that phenomena on bio-psycho or psycho-social level cannot be explanatorily reduced to a bio-medical understanding.

In his early days Franz Alexander, the 'father' of psychosomatic medicine, was interested in the application of psychoanalysis for criminology. Alexander's working hypothesis stated by stating that certain somatic diseases such as peptic ulcers and other gastrointestinal disturbances are triggered by emotional causes. Through his career he investigated the relationship between emotional causes for somatic diseases which is a stark derivation from the traditional biomedical model which suggests exclusively physiological causes for illness and disease (Alexander, 1952).

Georg Libman Engel (1913-1999) finally coined the term '*Biopsychosocial Model*' in his landmark article '*The need for a new medical model: a challenge for biomedicine*' where he discusses diabetes mellitus, schizophrenia as well as grief from a holistic, non-reductionist perspective (Engel, 1977). He refers explicitly to GST and Bertalanffy's concept of establishing common laws and principles of isomorphies which are causally efficient across different levels of organization, such as '*molecules, cells, organs, the organism, the person, the family, the society or the biosphere*' (Engel, 1977, p.134)

### **3. The Example of Pain and how a Reductionist Approach necessarily fails**

If pain was a phenomenon which can be reduced by understanding physical processes and one which can be objectively described by its underlying neuro-biological factors, then pain should appear as the same constant physical phenomenon to everybody.

The scientifically measurable fact is that it isn't.

For example, sad persons are more sensitive to pain than happy ones (Atsuo et al., 2011), depressed patients experience pain with far greater intensity as non-depressed persons (Saariaho et al., 2012). Pain is an experience and therefore involves qualitative description and evaluation. Pain can obviously be caused by physical tissue damage, but can also be caused by non-physical factors. As another example, physically unexplainable chest pain may appear for persons suffering from sexual and verbal abuse (Guy et al., 2011). These cases illustrate that a mere treatment with painkillers as used for addressing physical injury would render epiphenomenal.

Since the experience of pain differs by age, gender, personal attitude, salient beliefs, past experiences, environmental conditions and culture, a holistic assessment on the potential influences of a patient's experience of pain is required to address treatment options. Even non-psychogenic pain is not always easy to diagnose and treat with painkillers as the examples of *neuropathic pain* or *allodynia* demonstrate (Goud, 2007). In *allodynia* the body wrongfully interprets non-painful stimulus as painful. Neuropathic pain describes the spontaneous activation of nerve-cells from a site of injury and it can in most cases not be effectively treated by simply administering pain killers. This is why we need to understand pain as a complex phenomenon within its context and not a physical process which can be described in isolation.

## **Conclusion**

A reductionist approach such as e.g., the medical model states a mono-causal model of illness. The biopsychosocial model, by contrast, not only states poly-causality but also emphasizes the mutual interdependence between biological, social and psychological factors. A reductionist approach assumes predictions under controlled conditions while an open systems approach recognizes that evolving dynamic systems are more accurately described within a Bayesian network of distributed probabilities and shared influences. As the computational descriptions of interdisciplinary health-models become more common

and gain explanatory power for the understanding of human health, a reductionist understanding limits methodologically approaches to potential interventions. Reductionism fosters 'somatically fixated doctors' (Biderman, Yeheskel & Herman, 2005, p.385). For the practitioner the patient-centered biopsychosocial model requires for health-professionals to go beyond the relation of mere observer and the observed (Biderman et al., 2005, p.380), focusing on the development of personal qualities such as empathy and curiosity as well as communicative skills such as interviewing techniques and being able to listen to their patients.

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