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**A fundamental question for complementary medicine:
Are there other forces in the natural world besides the physical forces?**

**Eine zentrale Frage zur Komplementärmedizin:
Gibt es in der Natur außer den physikalischen Grundkräften noch weitere Kräfte?**

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Abstract

Background

The integration of conventional and complementary medicine reflects the pluralism in science. Still, a critical issue is the conception of the natural world. Many complementary therapy systems seem to contradict the reductionist-atomistic paradigm that all of natural reality is essentially based on the physical interactions of atoms and molecules. Thus, a fundamental question about the natural world is: Do other than the physical forces exist?

Summary

The assumption that no other than physical forces exist and work in the natural world is not tenable. For example, the formation and maintenance of the functional Gestalt of organisms cannot possibly be explained by molecular processes (e.g. from DNA to RNA and further to amino acids and proteins). The processes on each structural level – from molecules, organelles, cells, organs up to the whole organism – are regulated in regard to the formation of the next higher-level. Specific Gestalt-forming forces exist and can be systematically investigated. Their existence implies an extended conception of matter. The Gestalt-forming forces and the extended concept of matter may be relevant for the scientific assessment of complementary therapies.

Key Messages

- In the natural world, specific Gestalt-forming forces exist in addition to the physical forces, and can be systematically investigated.
- The existence of these forces implies an extended conception of matter.
- These forces and this extended concept of matter may be relevant for the scientific assessment of complementary therapies, for example homeopathy.

Zusammenfassung

Hintergrund

In der Integration von konventioneller und komplementärer Medizin spiegelt sich der Methodenpluralismus der Wissenschaft. Die Ontologien vieler komplementärmedizinischer Systeme liegen allerdings außerhalb der Erklärbarkeit durch die Kräfte der Physik. Eine zentrale Frage ist deshalb: Gibt es Kräfte in der Natur, die eine materielle Wirkung haben, deren Ursprung aber nicht in Atomen oder Molekülen und in diesem Sinne nicht in der Materie liegt?

Zusammenfassung

Die Annahme, dass in der Natur keine anderen als die mit Atomen und Molekülen assoziierten physikalischen Kräfte existent und wirksam seien, ist wissenschaftlich nicht begründet. Beispielsweise ist die Bildung und Erhaltung der funktionsfähigen Gestalt von Organismen nicht durch molekulare Prozesse (z.B. von der DNA zur RNA und weiter zu Aminosäuren und Proteinen) erklärbar. Die Prozesse auf jeder strukturellen Ebene – von den Molekülen, Organellen, Zellen, Organen bis hinauf zum Gesamtorganismus – sind in Hinblick auf die Bildung der funktionsfähigen Gestalt der jeweils nächsthöheren Ebene gesteuert. Für diese Gestaltbildung gibt es spezifische Kräfte, die systematisch erforscht werden können. Ihre Existenz impliziert eine erweiterte Konzeption von Materie. Diese Gestalt-bildenden Kräfte und

dieses erweiterte Konzept von Materie sind relevant für die wissenschaftliche Erfassung komplementärmedizinischer Systeme.

Zentrale Aussagen

- In der Natur sind außer den physikalischen Kräften noch weitere spezifische Kräfte wirksam, beispielsweise bei der Bildung und Erhaltung der funktionsfähigen Gestalt von Organismen. Diese Kräfte können systematisch erforscht werden.
- Die Existenz dieser Kräfte impliziert eine erweiterte Konzeption von Materie.
- Diese Kräfte und das erweiterte Materiekonzept sind relevant für die wissenschaftliche Erfassung komplementärmedizinischer Systeme, beispielsweise der Homöopathie.

Introduction

Scientific rationality and complementary medicine

In medicine, the conceptual understanding (of the human organism, disease, therapy) as well as the empirical testing rely on scientific rationality. According to the *Charter of Medical Professionalism*, commitment to science is an essential aspect of the medical profession [1]. The ideals of this profession have been reflected worldwide after the turn of the millennium [1-5], and they are generally valid for both conventional and complementary medicine [6]. The parallel existence of conventional and complementary medicine may seem to contradict the science obligation of medicine, but the pluralism principle is inherent to science itself: In mathematics there are different axiomatic approaches [7], and in the natural sciences there are pluralistic explanatory approaches [8] with competing [9] and complementary [10] models on different levels [11]. Furthermore there is a pluralism of types of evidence [12] and there is a plurality of thought-styles, thought-collectives and paradigms [13-15]. Thus, without abrogating the science orientation of medicine, the framework of medical pluralism offers ample space for different concepts of man and nature [6].

Still, a critical issue in the context of complementary medicine is the conception of the natural world. The backbone of the contemporary scientific worldview is the *reductionist-atomistic paradigm*. However, the basic ontological concepts of many complementary therapy systems [16] seem to contradict this paradigm [17-19].

The reductionist-atomistic paradigm

According to the reductionist-atomistic paradigm only four basic forces exist and are effective in the natural world, and only two of these, gravitation and electromagnetism, work beyond atoms. (The two other forces act within atoms and therefore will not be discussed here, nor any possible cosmological forces). Outside of the atoms, all natural phenomena are to be understood as effects of gravitation and electromagnetism (and to some extent of quantum-physical coincidence). "The macroscopic structures of our empirical world are based on two forces, electromagnetism and gravitation, and nothing else." [20]

Effects of these forces include e. g. the state of matter (solid, liquid, gas) and its chemical composition. These effects are determined by different parameters, for example how close the masses of atoms and molecules come together and how large the masses are. Electromagnetism can act both in the close range and over large distances as in radio waves or radar.

All such effects can only arise when a material cause exists: For a gravitational effect the material cause is the presence of a mass body; for an electric effect it is an electric charge; for a receiver it is a material sender; for the magnetization of a metal rod it is a magnet; for the charging of a battery it is an electric current; and so on [21]. Thus, the principle of causal explanation is reduced ("reductionist") to material causes and ultimately to interactions between atoms ("atomistic"):

- To achieve an effect, a material cause is needed.
- The relation between a material cause and a material effect is ultimately constituted by electromagnetic and gravitational forces between atoms.

With this reductionist-atomistic model our world is said to be "excellently describable". No other forces than those of electromagnetism and gravitation are needed to explain reality outside of atoms [21].

Apparent contradiction to the paradigm: the example of homeopathic high potencies

An example for the apparent contradiction to this paradigm is the use of homeopathic high potencies. When manufactured, homeopathic remedies are potentised by stepwise dilution either tenfold ("D") or hundredfold ("C"), each step accompanied by vigorous succussion. Already after the twelfth (C12) or twenty-fourth (D24) step of this potentisation no molecule of the original substance is left. Therefore, according to the reductionist-atomistic paradigm, specific effects of such homeopathic high potencies cannot be possible. "Without an active ingredient, nothing works" (20). Homeopathy has therefore been claimed to represent a scientific "null field" in which the positive outcomes of clinical trials simply reflect the magnitude of bias [22].

Objective

Against this background, the fundamental question is: Are there forces in the natural world with effects on matter yet not originating from matter (i.e. from atoms or molecules)?

Methods

Elaboration of: the limitations of the reductionist-atomistic paradigm, the existence of specifically Gestalt-forming and Gestalt-maintaining forces in organisms, and implications for the concept of matter.

Results

Other than the physical forces exist in the natural world

Since complementary medicine is used for the treatment of complex biological organisms, these are the focus of our objective:

In organisms we can distinguish different structural levels and transitions: the transition from the level of atoms to the level of elementary molecules; the transition from simple elementary molecules to organic macromolecules (DNA, amino acids, proteins, etc.); the transition from organic molecules to intracellular functional complexes (chromosomes, nucleosomes, ribosomes, etc.); the transition from the intracellular functional complexes to functioning cells, further to functioning organs, and even further to the functioning Gestalt of the whole organism. Important in this context is the process of gene expression, involving DNA, RNA, amino acids and proteins. As generally known, DNA consists of nucleobase sequences that can determine (via m-RNA and t-RNA) amino acid sequences, which again can determine (as predictable through the AlphaFold algorithm [23]) three-dimensional protein structures. There seems to be a continuous determined process all the way from the linear nucleobase sequences in the DNA up to the three-dimensional structures of the proteins.

The stages of this gene expression take place in dynamic functional complexes inside the cell (chromosomes, spliceosomes, ribosomes, etc.). Step by step, the transformations (transcription, translation) of the molecule structures are carried out: from DNA to m-RNA; from m-RNA to t-RNA; from t-RNA to amino acid sequences and proteins. All these transformations have a beginning, a process and an end, and all of them are mainly controlled by enzymes [24].

At first glance, these transformation processes seem relatively simple. They are, however, accompanied by retrograde processes that restructure the antecedent substances: There are modifications of the chromatid; transposons ("jumping genes") in the DNA; alternative splicing and reconstruction of the m-RNA; and cotranslational and posttranslational modifications of the t-RNA and amino acid sequences, including the recently discovered principle of targeted *mistranslation* of t-RNA [25-27]. These retrograde processes seem to be controlled by enzymes as well.

This model has an inherent problem: The anterograde and retrograde processes of gene expression must be coordinated with each other; furthermore, both types of processes have to be regulated with regard to the formation of intracellular complexes and organelles; these formation processes again have to be meta-regulated with regard to the formation and maintenance of the functioning cell; furthermore, the formation of the cell has to be regulated with regard to the formation and maintenance of the respective organ; and this organ regulation, once more, has to be regulated with regard to the formation and maintenance of the functioning Gestalt of the overall organism. Thus, hierarchical meta-meta-meta-regulations are at work. To assume that the totality of these regulations arises out of nothing but atom interactions, is a mere hypothesis, without conceptual or empirical confirmation.

Even if an association between a certain DNA sequence and a certain phenotypic appearance of the organism can be demonstrated, and even if a complete causal chain from the DNA, via proteins, to the phenotypic phenomenon could be identified – this would not explain the design of the organism's functioning Gestalt and structure. Such a causal chain (if it would be identified) could function in the organism only if embedded in this very organism. The causal chain presupposes the existence of the organism itself and, therefore, cannot explain the formation and maintenance of the functional Gestalt and structure of a complex organism.

Still, we might assume that large numbers of these causal chains exist in an organism and interact with each other and, being a complex causal network altogether, will ultimately produce the Gestalt of the organism. This hypothesis still does not solve the problem: In order for such interactions to produce a functional organism, they would have to be orchestrated by an effective principle which, in itself, would have to be oriented towards the formation and maintenance of the totality of this organism. For the existence of complex organisms there is a need of Gestalt-forming forces beyond the atomic-molecular interactions.

The existence of such forces becomes most obvious if we go back to the underlying premise that all biological processes are ultimately caused by electromagnetic interactions of atoms (covalent bonds, van der Waals forces). Already in its very onset, this premise is a factual impossibility: Relatively simply structured interaction forces of relatively simply structured building elements cannot, by themselves, produce a complex organism. In order for the meta-meta-meta-controlled formation and maintenance of the functioning form and structure of a complex organism to emerge, additional Gestalt-forming forces (causative organizatory "principles", "energies", "fields", "informations" etc.) must be added.

Complexity research [28] and the principles of "downward causation" [29] and of emergence [30] point in this direction, even more clearly the gestalt biological concept of agency [31, 32]. Preliminary investigations of such forces can be found, for example, in Rupert Sheldrake's research on morphogenetic fields [33], in the cell biological work of Sonnenschein and Soto [34] and in basic experimental research on cancer tissue [35].

Reductionism as negation of scientificity

It is clear to many scientists that the reductionist program of research and explanation – i. e. the whole of biology should be "explained" by its subordinate levels, down to the level of atoms – has completely failed. As Hans Primas points out, reductionism is "palaver without precedent." "Reductionism is dead." It has been accepted only "on faith and without logical evidence or sound reason" [36]. It already failed within physics, then also in the attempts to reduce chemistry to physics, and finally also in biology. The physicist Renzo Morchio underlines: "The 'reduction' of the basic terms of biology to terms of physics, for example, also in the simpler cases, presents insurmountable obstacles" [37]. Even Ernst Mayr, prominent representative of Darwinism, argues the same: "It is certain that the reduction of theories even in physics has been only partially successful and in biology decidedly unsuccessful . . . the attempt to unify science by reducing biology to physics [has] failed . . ." [38]. For Evandro Agazzi, reductionism ultimately means a renunciation of scientific attitude: "reductionism as negation of scientificity" [39].

Other explanations? – "Not necessary, not possible, not wanted"

Any closer look on complex organisms shows that their Gestalt formation can *not* be explained by its partial aspects (its causal networks, its causal chains, its DNA, its electromagnetic molecular or atomic interactions). The belief that interactions of atoms and molecules can explain organisms is a dogma.

According to this dogma, other explanations of the natural world are *not necessary, not possible, and not wanted*:

It is not necessary for the explanation of reality to go beyond the basic physical forces [21]. – This assumption, however, is an unfounded position. The contrary is true: It is necessary to open the scope of science for other forces of nature.

It is not possible to have other scientific explanations for reality besides on the basis of the physical forces. – However, such an assumption would be false, as can be shown already with regard to fundamental physics and biology:

- *Physics*: Just as there can be other forces in addition to gravitation, e.g. those of electromagnetism, and just as the effects of both kinds of forces can overlap, non-physical forces can also exist and their effects can overlap with the effects of the physical forces. It is an irrational prejudice to assume that further forces, e.g. those of Gestalt formation, could not exist.
- *Biology*: Just as the biological processes can be regulated by catalytic enzyme effects and just as these catalytic enzyme effects do not affect the law of conservation of energy, further catalytic regulations can also exist, for example on behalf of Gestalt-forming forces, and these further regulations need not affect the law of energy.

It is not wanted to have any extension of the purely physical explanation of nature. Many contemporary scientists are still socialized in the tradition of the 19th century, when science was willfully shaped to offer a purely mechanistic, reductionistic, atomistic explanation of nature, with nothing beyond. Even the words of “conspiring” and “denying” were used (though not in the sense of today’s conspiracy theories). For example:

- Emil du Bois-Reymond (1841): “Brücke and I, we have conspired to assert the truth that in the organism no other forces are active than the exact physical-chemical ones” ([40] p.108).
- Rudolf Virchow (1845): “The latest medicine has defined its approach as mechanical, its goal to establish a physics of organisms. It has proved that life is only an expression of a sum of phenomena, each of which proceeds according to the ordinary physical and chemical (i.e. mechanical) laws. It denies the existence of an autocratic life and of a natural healing power” ([41] p. 7).
- Hermann von Helmholtz (1847): “Natural phenomena are to be traced back to the movements of matter with unchanging forces of motion, which are dependent only on spatial conditions. . . Thus, the task of physical science is finally determined to trace back the natural phenomena to invariable forces of attraction and repulsion, whose intensity depends on the distance. The solution of this task is at the same time the condition of the complete comprehensibility of nature” ([42] pp. 4-6).
- Thomas Huxley (1861): “The final object of physiology is to deduce the facts of morphology on the one hand, and those of distribution on the other, from the laws of molecular forces of matter” [43].

Thus, a paradigm was established and enforced, especially for the life sciences. The modern research program of biology, successful ever since, was then initiated. – However, for today the same paradigm has become a horizon-limiting dogma.

The illusion of “we know”

How can we know that under all conditions matter consists of atoms and molecules and their interrelations, and has no properties beyond?

- We “know” it, because the atomistic model has a far-reaching explanatory power. However: This explanatory power only demonstrates that matter behaves *as if* it consisted of particles. Moreover, this kind of explanation is limited; biological organisms cannot be explained with the atomistic model.
- We “know” the validity of the atomistic model also because matter can be investigated in experiments with electromagnetic forces and radiation, and because in these experiments matter appears as having a particle structure. However: When matter is examined electromagnetically, only the electromagnetic structural properties of matter (connected with its mass) will appear. Therefore, such investigations cannot exclude the possibility of matter being receptive also to other kinds of forces.
- Finally, we “know” the atomistic structure of matter through the *scanning probe microscopy*. It can make atoms somehow visible, particularly in solid bodies. However: This form of microscopy cannot ascertain that matter, especially in fluids and gases, does not have other properties as well.

Other properties of matter

As soon as we recognize that other forces besides the physical basic forces exist and are effective in the natural world (see above), the concept of matter starts to evolve. In order for these other forces to have effects on matter, the corresponding material (for example in an organism), must be able to resonate with these forces. This is true already for the physical forces: In order for a gravitational force to act, there must be a body having a mass; for an electric

force to act, the body must have an electric charge; for a magnetic force to act, the body must have magnetic properties. The same does necessarily apply to the Gestalt-forming and -maintaining forces in the above sense: They can act on the material substance of the organism only if the substance is receptive to them. In other words, matter must also have properties other than the electromagnetically influenceable atomic and molecular structures. Both belong together: The existence of other than the physical forces require the existence of other properties of matter besides the atomic structures and their interactions.

Already quantum mechanics brought unexpected surprises for the concept of matter such as the uncertainty principle [44], wave-particle-duality [45, 46] and non-local entanglement [47, 48], all of which primarily concern the smallest constituting features of matter, the *particularistic* quanta. In contrast, the extension of the concept of matter discussed here will primarily concern the largest constituting features, the *holistic* forces of an organism's functional Gestalt formation. These new research perspectives are no less challenging than those of quantum physics. A first step in this direction is an exact systematization of the different types of organismic formations and the corresponding natural forces and properties of matter (which will evidently be different than the atomic-molecular structures [49]). With this approach, it will even be possible to explain how formative forces can be integrated into liquids by stepwise potentization [49].

The example of homeopathy

To acknowledge the existence of formative forces and of the correlating non-atomistic properties of matter will have consequences for medicine, particularly for the scientific assessment of complementary therapy systems. For example, the argument against homeopathy (there are no molecules in homeopathic high potencies) may turn out as irrelevant in regard to the extended concept of matter. This concept also may explain the reproducible effects of high potencies in various test systems [50-56]. Furthermore, when homeopathic high potencies do not primarily effect physico-chemical processes of the organisms but work on the higher level of Gestalt formation and maintenance, it may be not surprising that they have unfamiliar modes of action such as the Simile principle ("like cure like").

Conclusion

The assumption that no other than physical forces exist and work in the natural world is not tenable. For example, the formation and maintenance of the functional Gestalt of organisms cannot possibly be explained by molecular processes (e.g. from DNA to RNA and further to amino acids and proteins). The processes on each structural level – from molecules, organelles, cells, organs up to the whole organism – are regulated in regard to the formation of the next higher-level. Specific Gestalt-forming forces exist and can be systematically investigated. Their existence implies an extended conception of matter. The Gestalt-forming forces and the extended concept of matter may be relevant for the scientific assessment of complementary therapy systems.

Statements

Conflict of interest statement

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Author contributions

HK wrote the first draft and is lead author. HK and HK critically assessed and revised the draft.

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