

CYBERATTACK on the nervous system of the BRAIN - Where does the digital revolution lead?

Interview with Professor Dr. Dr. Gertraud Teuchert-Noodt

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Acceleration and loss of space and time: psycho-cognitive functions - against the background of a spatio-temporal work of the nervous system - remain lifelong subject to defined biological conditions. For the first time in the history of mankind, this neural foundation, which is absolutely necessary for thought processes, is called into question by the digitization.

"Digital media is fulfilling a fundamental dream of humanity: the mastery of time and space, but that also entails a great danger", says brain researcher Professor Dr. Dr. Gertraud Teuchert-Noodt from the University of Bielefeld. If media users do not get the upper hand over their actions and plans they succumb unnoticed to a kind of cyberattack on the networks of their brains. Particularly those subsystems, which are responsible for the memory formation and for the cognitive achievements are attacked. This can cause the loss of cognitive judgment, anxiety syndrome, addiction, burnout or depression. A new challenge both in terms of study and in the world of work will not allow the media to put us into their service. It is therefore useful to know more about those nerve networks in the brain that make us strong. At the beginning of May the brain researcher gave a lecture on "Where does the digital revolution go?" at the Technical University of Darmstadt/Hesse. "If we keep the cart running like this, a whole generation of digitized children will return to the Stone Age" Teuchert-Noodt warns.

Visionsblog.info: **Professor Teuchert-Noodt, you are talking about the 'Cyber attack on the brain nerves'. What is meant by this, what can / must the laity imagine?**

Prof. Gertraud Teuchert-Noodt: It is what it is: no matter whether a cyber attack is directed indirectly to the computer networks of digital highly-equipped devices that are important for specific infrastructures or directly to specific brain nerves, both have a corresponding penetrating force. Thus, just as hackers can shut down the power supply of a hospital, media users in their own brain can override the care center for the entire information processing at the psycho-cognitive level and cause an emotional / mental exhaustion. Maybe a brain crash is even worse. Because the neurochemical and brain-rhythmically controlled functions in the corresponding highest brain regions - the limbic prefrontal system - are very difficult with a recovery from a digitally induced attack, especially since this is accompanied by imperceptible creeping symptoms.

Visionsblog.info: **How is the human brain prepared for digitization?**

Prof. Gertraud Teuchert-Noodt: The human brain has been prepared for digitization for at least three thousand years, since the Phoenicians introduced the current alphabet. For three centuries, however, the schooling of the child, writing, reading and counting could become a cultural and technical success. The sensory-motorized bark fields of the child's brain,

maturing in a defined time window, are optimally applied. Only the fully mature primary and secondary nerve networks in these cortex fields allow the adult to become creative in abstract patterns of thinking and also to deal wisely with digital media, or perhaps even write programs and algorithms.

It is a fallacy to assume that the modern child can take over the handling of digital media directly from adults, due to the minimal technical effort. According to the knowledge of brain research, the child's brain will not be prepared for a deal with the media in the next thousand years! For cognitive performance is dependent on the prolonged and intrinsically induced maturation of primary and secondary nerve networks in the child's cortex in order to accomplish later associative work. It must be stressed at this point that digital media act as extreme acceleration factors on the maturing functional systems of the cortex by producing a kind of emergency maturation of the nerve networks and are irreparably addictive.

If we let the cart continue, a whole generation of digitized children will return to the Stone Age. It has long been apparent that even the adult has not grown infinitely in the technically highly equipped working world. After all, biological conditions conditioned by psycho-cognitive functions remain subject to the background of a spatio-temporal work of the nervous system. For the first time in the history of mankind, this neural foundation, which is absolutely necessary for thought processes, is destroyed by the digitization.

Visionsblog.info: Is there any wise way to deal with digitalization reasonably?

Prof. Getraud Teuchert-Noodt: Reasonable handling of digital media demands the adult self-evident intelligence to control the conscious use of media and digital media. And in any case, it is – and precisely from the point of view of current findings on the abilities and limits of the human brain - urgently necessary for socio-political reasons to redefine human workplaces and adapt them to the neuronal capacities of employees.

In terms of children and young people, however, "dealing with digital media" means a greater challenge to parents and educators. It is most sensible if parents can get their children to abandon all electronics, and if digital media from kindergartens and primary schools disappear completely. There are two reasons:

1. Brains of children need the physical movements to program experiences in space. This is mediated by the maturing equilibrium system (= vestibular system) as well as the muscle and tendon spindles of the movement apparatus. At the same time, the three spatial palaces in the cerebellum are programmed over our lifespan into three corresponding switching planes: running, climbing, twisting and balancing remain the initial stimulants, without it the cerebellum cannot develop normally. The more extensively the childhood years are filled with movement activities, the more optimally this affects the maturation of mental functions. For these early-child experiences are also reflected linearly on the degree of differentiation between higher downstream motor circuits. In addition, painting, tinkering and the creation of networks in sensory-motorized association fields of the cortex and the elucidation effects the specification of their interconnections. The agile play behavior of the child remains a necessary component of cortical-emotional maturation and leads to stimulation of complex operations such as attention, judgment and social behavior. If the Artificial Intelligence-researchers believe that all these vital functions with the gift of a "cognitive smartphone" can be put into the child's cradle, they will abolish themselves in medium term.

2. Deceptive dangers lurk additionally for the brain of the child at the level of the limbic system. Keyword addiction (see also below): In the long run one assumes that the digital addiction as a non-material dependency is different and perhaps less harmless is the drug addiction. That is a mistake! In both cases the same places of the limbic system, brain-own opiates are thrown over in excess, which physiologically destabilize a self-reinforcing closed circuit as a "reward system". This circuit is not rewarded by material drugs such as coca leaves and amphetamines, nor by the brain-hopping messages of the tablet and the smartphone. But in any case an almost devilish automatism is set in motion. The self-amplifying circuit, in addition to the opioid receptor system, also includes the highly dynamic hippocampus, as a bypass. In addition all emotional experiences are introduced into the amygdala. For children there is no possibility to self-control. They are helpless prisoners of their own. Only from adolescence onwards the frontal lobe can with its progressing maturation cooperate with the limbic circuit in a controlled manner and deal with media.

Visionsblog.info: In your lecture, you showed a picture of the Homo erectus with the headline "Let man know what you are". What do you mean by that?

Prof. Gertraud Teuchert-Noodt: From an evolutionary point of view, Homo erectus was subjected to a major challenge about two million years ago. At that time the expulsion from paradise, known from Biblical mythology, took place. Biological weapons had been lost to him. What should he do? This was the selective pressure on more brain ability, that is, more of such abilities that would allow him to resist the powers of nature. So more learning ability with increasing brain volume and prolonged childhood to use flexible thought, planning and creativity was in focus. The ecological niche of Homo sapiens is thus to be seen in a completely new, perennial structure, the frontal lobe, which enables humans to think in space-time in historical categories and to advance to new horizons by means of creative ideas. These features were not a casual gift of nature, but they had to - and they have to be redesigned newly in every human life. Natural cognition cannot be replaced by "cognitive informatics" and "big data". If we do not successfully defend ourselves, then digital media will take our self-determination and human dignity, and will probably throw entire societies into chaos. Only then will we be aware of what the human mind does every day for the first time. Let us try now to understand what is meant by natural intelligence.

Back to the beginning: Biologically speaking, the ecological niche of Homo sapiens is due to a new emergent structure, the frontal lobe. Deliberately thinking, planning and acting places man into the superior position of all other living creatures creatively creating a new "world in space and time" on this planet that has not yet existed, creating cultures and transcending cultures. The question of existence of man depends on this spatial and temporal ecological niche. For the unpredictable dangers linger a new for every generation, and every human child must continually strengthen his forehead to meet them every day. This is what I recently presented in detail in another article (Teuchert-Noodt 2017a).

Digital media is an insidious attack on the very own claim of the human frontal lobe to acquire these abilities in its early life. Electronic media are, in particular, an attack on the brain in childhood and early childhood. The spatio-temporal abilities of the frontal lobe are not derived directly from a genetic program. Instead, they are restructured from birth into the available nervous system. The childhood and youth phase, which has been extended for the human species among the primates, is ready for this. Every human child must be able to develop and strengthen his frontal lobe, this means space-time-related abilities. This concerns the development and strengthening of curiosity, courage, will, social behavior, decision-making power and anticipation ability, which is an important preliminary step to succeed the next day.

Digital childhood education automatically prevents the maturation of these essential vital qualities. To know the omniscient smartphone in the schoolbag alone exhales the childish spirit of the effort to really embed the knowledge bases that the teacher has tried to implant into the bark fields of the brain. How was it in our school and student time? As soon as you

could put some text-pieces into your pocket, they might be stapled, and that was it. Let us imagine what will happen if children and young people grow up without any societal or historical knowledge. If they don't associate bark fields of the brain with diverse experiences, but rather store them into clouds - they will be weakened mentally. If the digitally-dressed schoolchild is not given the chance to undergo the necessary process of slow mental and emotional degeneration from the mother and not develop self-employment, than mental destabilization in development, anxiety, aggressiveness and many other deficits will intensify. Experienced psychiatrists have long been able to report this. We are already in the middle of the digital life experiment.

Without the permanent spatio-temporal grounding of the frontal lobe, the adult media freak also gives up the control of his life out of his hands. He cannot but crash into a "learned helplessness" (Martin Seligman, 1967). This is a cognitive self-constraint and is one of the reasons why the modern working world has been conquered by a burnout syndrome for several years. It is a psychosomatic disease that has not existed in the pre-digital age, in my youth. In concrete terms, the sudden appearance of this new national disease has to do with the various medial time-space accelerators, which simply overwhelm the frontal lobe. A physiological view of the working memory of the frontal lobe would at this point help the potential patient preventively.

To the working memory: Every conscious information takes up the two factors time and space in the networks of the frontal lobe. An information - which is delivered via the spatial preprocessing of the hippocampus - is divided into units that require at least 3 to 5 seconds of presence. This active window serves to reconcile the event with the past, present and future. Nothing runs at too fast clocking. Carrying out a logical thought requires even the use of further time units.

In his essay "Thinking, fast and slow" (2011), Daniel Kahneman has called for separate systems for both thinkings. Slow thinking allows to concentrate, develop endurance, and lead mental operations, such as complex calculations, to logical results. It needs the frontal lobe functions in its fullest extent. In order to quasi-deeply grasp, it requires a constant practice. That is why my recommendation is "use the brain instead of mobiles and the navigation system of the car" (Teuchert-Noodt, 2017b). When Kahneman speaks of a general "laziness" of slow thinking, this is very much in line with the commercial turnover of digital media. The seduction will be great when the "virtual assistant" some time ago announced in Silicon Valley has reached the normal consumer. Then the digital partner first displaces the abilities of the frontal brain, to which also belong, to have pleasure and interest, to think for ourselves today and tomorrow, this means to anticipate. All this and more of the things that make us really happy, why do we just give up?

According to Daniel Kahneman, the "Fast Thinking" system works automatically, effortlessly, without deliberate control, without decision-making and without concentration. If the psychologist Kahneman additionally proves that this system only performs superficial and fleeting operations that are associated with unconscious feeling strength, this clearly supports

the interpretation of brain research that this thinking is not working together with the frontal lobe. This fits very well into our fast-moving time, because digital media have long since latched into this fast thinking system and accelerate us once more.

In the brain, digital acceleration hinders neuronal sequencing and neurochemical communication between cell groups, which serve to transmit excitatory patterns to remote nerve networks. This produces cognitive impotence. But nobody wants to write that on his forehead. That's why let us avoid and renounce digital assistants! We need the whole use of the frontal lobe also for our social survival, for a "more democracy dare" (Willy Brandt). This requires courage, freedom to more self-responsibility and judgment. Instead, Silicon Valley researchers are moving step by step to physiologically impose a non - invasive lobotomy on the frontal lobe of our young generation. About eighty percent of them are in the meantime equipped with smartphones, and - voluntarily (!) on the way into incapacitation.

Visionsblog.info: There is a public appeal from German university lecturers for the dramatic drop in mathematics in schools. What has been the effect?

Prof. Gertraud Teuchert-Noodt: This call of March 2017 has had the effect that pedagogues have vehemently justified publicly, but obviously do not feel compelled to think about the causes, which the appeal clearly states: "Nor a superficial mediation, a deeper content-based employment no longer takes place ". And the ministers of education and culture may ensure that "Germany's schools can return to a mathematical education oriented towards subject matter. Important foundations are included in the curricula ...".

The dramatic drop in performance in the field of mathematics has, on the other hand, caused the fact that neglecting "symbolic, formal and technical elements of mathematics and abstract content" does not teach the fundamentals of thought. As stated above, the fundamentals of thought are spelled out by the early-celestial experiences of space, and that is to say "deactivated," as educators had already recognized in the last century. And since then have been deliberately trying to bring higher geometry and mathematics via spatial group games to young people. This effort was worthwhile as the spatial understanding of the pupils increased and made it easier for the teachers to lead the lessons to success. If digital media in the input stage of mathematics counteract such meaningful efforts, it makes the nerve network incapable carrying out logical purchases.

Visionsblog.info: Why is it so important that smartphones are kept away from small children?

Prof. Gertraud Teuchert-Noodt: If they are already using smartphones, tablets and more, they are automatically and quickly integrated into a dependency. This is organized in a limbic circuit, which works under the threshold of consciousness in the brain and which the immature brain of the child does not yet have access to (as a "reward system"). Moreover, such a kind of dependency leads automatically to the fact that the

nerve networks in higher bark fields of the brain - for example for talking, writing, reading and calculating - can only be supplied insufficiently by the limbic hyperactivity of a digitized child. Corresponding functional performance can be difficult to make up in the later development, when the train has left the station. The infant is affected by a constant intrinsic stress which is expressed in hyperactivity or inactivity and depression. There are two aspects to be considered: First it is hardly possible to program the child in the medium term to 1/2 media hours per day. The danger of addiction creeps in anyway. One knows that a daily smallest alcoholic drink is sufficient to make a child an alcoholic. Second, the child's brain, which is designed as an imitation of the parents, is particularly vulnerable when the child observes the constant use of digital media by parents. Parents can only become a role model again and turn away the addiction risk of their child, if they renounce themselves in the private life as far as possible on smartphone and Co.

Visionsblog.info: You warn against electrosmog, it can influence the thinking. Why?

Prof. Gertraud Teuchert-Noodt: In the meantime there are many indications that electrosmog is a cause of tumor formation in the brain. But there is little evidence that - below this disease threshold - cognitive performance can also be manipulated by extrinsic electromagnetic waves. With the perennial rhythms it interferes with them in this or that subsystem, and have a negative effect on phase-synchronized higher-order oscillations. We have conducted a specific pilot study (Hoffmann K, Bagorda F, Stevenson AFG, Teuchert-Noodt G (2001), Electromagnetic exposure effects of the hippocampal dentate cell proliferation in gerbils, *Ind. J. Exp. Biol.* 39, 1220-1226), Which we had described as notable in a local magazine, which is why we had elected a renowned indian specialist journal. The result was a "window effect", which means that defined frequencies of a magnetic coil permanently altered the new formation of nerve cells in the hippocampal nucleus of the rodents. The highly sensitive neuroplasticity in the limbic system, which has recently been recognized, is of central importance for learning and memory formation. Many further quantitative studies on the plasticity of nerve cells and transmitters (in our Bielefeld laboratory) allow for the conclusion that, under defined extrinsic electromagnetic oscillations, functions in the frontal brain and association cortices could be significantly interfered with in their function. This applies to the learning ability, concentration, reasoning, motivation and general mood.

Visionsblog.info: What is the consequence for everyday life?

Prof. Gertraud Teuchert-Noodt: As little use as possible of electronic devices in the household and the rest of private life. No WLAN in schools!

Visionsblog.info: You advise walking (without smartphone) to generate ideas. What happens during this activity in the brain?

Prof. Gertraud Teuchert-Noodt: The brain is lifelong programmed for motoric activities, which, together with other sensory perceptions, are fed into the senses and the movement

apparatus. When sitting on a desk, the hereditary activities are shifting to the highest level. First, it creates concentration and high thinking. However, the capacities of the necessary and transmitter-controlled processes are limited, recreational phases are necessary, movements such as walks have a particularly positive effect. For, slow rhythmic body movements and casual subliminal sensory impressions regenerate and stimulate the perceptible physiological processes on a holistic level and lead them to a rearrangement of the background neural activity. Especially the rhythmically slow vibrations of the step support this holistic brain stimulation to a high degree. The "slow thinking" postulated by Daniel Kahneman here comes back to us through which creative ideas flow.

Visionsblog.info: You say it's better to read texts on paper than on the screen, why?

Prof. Gertraud Teuchert-Noodt: The last years of self-awareness at the university, where the computer has also permeated students, have made me wonder why the brain does not read, correct and interpret screen texts as carefully as the texts on paper allow. A finished piece of paperwork then revealed how many mistakes I had missed on the screen. My preliminary brain-physiological explanation is the following. For a deepened reading of a text, more than the senso-motor association fields directly responsible for reading are required in the parietal and occipital cortex.

However, the eye only focuses on reading on the screen and uses the serial connection of the excitation transmission in the cortex. One can call this a reductionist reading with a limited mental focus. The text is fast and fleetingly read, page by page is literally "wiped" on the tablet. Daniel Kahneman's "System of Fast Thinking", which the author says is largely automatic and superficially fleeting, is thus involuntarily used.

But at the same time, the text-reading process also has to be done on the basis of a formal / substantive assessment work. The "System of Slow Thinking" is required, in which as many cortical association fields as possible are required to cooperate. Intrinsic multitasking is a system property of the brain, which is easier to access when reading the text on paper. In addition to the serial circuits, the parallel predominantly right-hemispherical circuits are then activated neurons. Short sub-aspects are read subliminally redundant. This promotes the deepened handling of the content.

In addition, the working memory in the frontal brain is used to allow conscious deliberations lasting a few seconds and to leave associative activities on both hemispheres - and thus on the entire paper. The eye can remain large and generous in the text on paper, which is an important attribute of the slow thought system. Recent results of electrophysiology on cognitive space counts have shown that the visual cortex plays an initial role in stimulating visual-spatial activities for further mental processes. Concentration and memory formation depend on cooperation with the visual cortex.

Visionsblog.info: Is there a conclusion to the dilemma "Human brain and digital world"?

Prof. Gertraud Teuchert-Noodt: There should be no dilemma if man were to fulfill his destiny and ability to give reason and responsibility the highest priority and not to be used by the digital media, but to use it as a hand tool use.

This would be a concise conclusion, which comes from the latest findings of brain and evolutionary research. However, the acute situation does not adequately justify this in the face of the scissors that opens between the digital world and the human brain, specifically between economic profit thinking and human reason, between an informed minority and an uninformed majority in our society. These perspectives offer perspectives to open up the eyes of many people, to demand their commitment, and to find solutions for how the brain and the digital world can be mutually compatible.

The irony of fate is that two initiators (the mathematician Norbert Wiener, 1948 and the behavioral psychologist Donald Hebb, 1949) had brought the stone into motion for both the natural and the technical intelligence research - to the middle of the last century. Norbert Wiener has established cybernetics as a joint research field of computer science and biology, and Donald Hebb has given the two disciplines together the postulate of activity-driven network plasticity. The two theorists have not been able to guess how quickly between the biological intelligence research and the technical Artificial Intelligence research a seemingly unbridgeable trench has opened. If man really wants it, the natural intelligence remains superior of the Artificial Intelligence. Why this is so can be briefly summarized to the technicians.

Brain research has fully confirmed the Hebbian postulate on neuromolecular, chemical, and electrophysiological levels. But this was only the beginning in the neurobiological experimental research, which is now booming for more than half a century. It has deciphered the complex process of higher development in the child's brain. Again and again, it is a miracle how individuality and geniality are unfold in a human child. How new levels of nervous system networking arise from previous structures through partial reorganization and thus functional and creative behaviors are born from a solid foundation. In addition, behavioral researchers and neurobiologists have shown critical development phases in which the environment is selectively programmed into the interconnections of nerve networks. At the same time, physiologists have shown how

fragile this whole event is against stressors, traumatic events, and non-material substances that are addictive (also against digital media), and which neuropathological processes can be triggered in the cerebral maturation.

Cultural evolution has used every single human being to ensure continuity and the constant renewal of the sexes. And the order remains: "Let you think of something, man, your dowry is the frontal lobe". A first idea would be to introduce the digital driving license. Children until the age of eleven, better twelve, years should be kept completely away from digital media. Alternative offers such as hiking, playing, sports, have always proved their worth. From the age of twelve onwards, a first driving license can be introduced at schools of more than 16 years. Parents of small children should apply that they even renounce to digital media in the private life as well as keep other stress factors small. That would release them from a lot of anger and worries, improve school performance and give the opportunity for a new media generation to grow up.

Although the considerations so formulated are certainly theoretically coherent and practically reasonable for the intelligent person, they are very different from the actual reality. At the moment, they are not solving the dilemma that has arisen from the social confrontation of the natural with the artificial intelligence. Rather, it all cries for more education. The attainment of more media competency can no longer leave the abundance of life-changing results of brain research. The elucidation of the ambiguity of media competency can no longer ignore the clear meaningfulness of human brain competence.

Let us, finally, deal more consciously and that is to say more knowledgeable, with our mental faculties.

Prof. Dr. Dr. Gertraud Teuchert-Noodt headed the Department of Neuroanatomy / Human Biology at the University of Bielefeld, Faculty of Biology. Specific fields of research include quantitative immunohistochemistry of neurotransmitters and neuronal networks in the development of psycho-cognitive brain functions. In her lectures she critically deals with the effect of digital media on the brain, for example at the beginning of May at the Technical University Darmstadt or in June 2016 at an event of the network culture2business in June 2016. Title of lecture: "Cyber attack on our brain? Strategies for a healthy use of digital media in companies. "

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