

## Perception of the World and Human Relations in the Digital Age

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## 1. Education

Knowing how younger generations access different types of knowledge is one of the main goals of professionals involved in education and in the study of human development. Nowadays we all interact with two parallel realities, one that is physical and tangible, and another that is virtual and mainly visual. This results in an evolution of learning channels that interact with the information underlying our adaptations and our knowledge. The brain has a corporeal nature and cannot think without a motor function. All that we experience has a corporeal nature and is driven by a purpose. Even the mere act of thinking entails a muscular activity. From the day we were born, coordinated motor schemes are constantly stimulated, induced and consolidated by means of activities that are instrumental to our adaptation, and contribute to form our memories and our implicit learning. Accordingly, wrong habits can significantly affect the way in which the nervous system adapts, and, based on the neuroplasticity principle of “use it or lose it”, they can even reduce its ability to do so. Since childhood, our primary experiences are made through motor learning processes occurring in a concrete reality, laying the foundation for the evolution of our complex cognitive activity which will later become capable of abstraction [1].

The physical and virtual realities have different features that affect our learning and interaction modalities in a different way. In the physical reality, our adaptation to the environment is facilitated by the attentive function, which is a filter we developed through evolution that enables us to carefully select several environmental data. This promotes self-regulation through an activation/inhibition system that modulates our behavior by means of praxia and manipulative activities. Orderly sequences of motor actions are supplemented by tactile, visual and proprioceptive activities enabling us to interact with the

environment and the objects. All of this leads to the adaptation that improves our knowledge and our quality of life. Our motor orientation is facilitated by the broad vision of our visual perceptual system, which is made up of a central vision and a peripheral one. The latter enables us to perceive environmental stimuli on either side of the visual field, thus enhancing our ability to explore and acquire information. These abilities were achieved by Homo sapiens over millions of years, and enabled them to develop different skills, including elaborate ones such as hand writing. They were also beneficial from the chemical point of view, because they promoted the release of substances supporting the body and the brain activity [2].

## 2. But to What Extent are our Behaviors Affected by a Prolonged Exposure to Virtual Reality?

Virtual reality provides unlimited and unconditional access to a plethora of information, and allows us to reach out to physically distant people with whom we can chat, but also build fictitious relationships totally devoid of sensory and motor experiences (i.e., eye contact, handshakes, progressive acquaintance, proxemics and facial expressions accompanying interpersonal communication). As a result, we have an altered perception of the relationship and of the information related to it, which is decontextualized and not always reliable or free of risks.

Virtual reality does not require any particular effort in terms of self-control, because during the interaction people don't need to move much and their behaviors are less self-regulated. With the push of a button, you can authorize something that may require more thoughtful consideration, and you can express your appreciation of something without being totally sure or properly informed about it. This results in an oversimplification of thinking, with vague intentions that in the physical world would necessarily be more reasoned.

Furthermore, waiting times are extremely short in virtual interactions, leading to a constant nutritional support to the reward circuits located in the frontal lobe [3].

### **3. What are the Effects Produced by Physical Interaction and What are the Ones Generated by Intense Virtual Interaction?**

In physical interactions, motor skills are regularly practiced, together with perception channels that engage with the environment. With time, this experience generates and consolidates learning, benefiting the nervous system's metabolism, brain oxygenation and memory. It also promotes self-esteem, which is strictly connected with the pursuit of goals in the physical world, where communication and sharing are perceived as a completely corporeal experience. Physical and corporeal interactions produce a more comprehensive message, resulting in a clearer perception of social and emotional relationships. Conversely, an excessive interaction with the virtual world leads to a decreased motor activity and sensory experience. The latter has an objective nature and is greatly influenced by our ability to interpret the world, since each individual has perceptual requirements that are slightly different from those of other individuals [4].

A person interacting with the virtual world for long hours during the day leads a sedentary life. In this type of experience sensory activity is also progressively reduced. Research conducted by the Zurich University and published on *Current Biology* used neuro images to show that cortical areas associated with fingertips are significantly more active compared to others when there is a constant interaction with a digital device. In one of his books, scientist Norman Doidge said that the interaction with a digital device stimulates the central vision, which becomes hyper activated against the peripheral vision. The peripheral vision is the one that provides the right perception of the surrounding world, of which we are aware thanks to our right and left visual half fields [5].

Californian photographer Eric Schmidt captured an image that he considers to be very representative of our time: he photographed a skipper off the California coast who is so immersed in his smartphone that he misses the once-in-a-lifetime experience of seeing a cetacean coming to the surface right next to his sailing boat. This picture shows that when a person's attention is focused on a digital device, the central vision is enhanced to the detriment of the peripheral vision, and isolated from the background. Other effects produced by virtual experience include changes in the features of different learning types. Oftentimes biorhythms are affected too, especially when people stay up surfing the web until late at night and fail to get enough sleep. This may result in the dysregulation of the endocrine function and of blood sugar levels, as shown by a study conducted by Josiane Broussard and her colleagues at the Cedars Sinai Medical Center in Los Angeles. Moreover, attention circuits are disrupted due to the overload of visual information that the working memory struggles to process, since they are not properly selected in their journey to the long-term memory store [6].

The feeling of dissatisfaction produced by the lack of concreteness of this type of interactions can, in the long run, lead to a state of depression and stress. It can also lead to addiction and avoidance of real-life social interactions, because the brain perceives them as being more challenging, neglecting the fact that they are definitely healthier and more appropriate. What role can education play in this scenario? Education has the task to save human relations by leveraging their original nature, therefore by fostering physical and direct forms of communication and interaction. Fostering the practice of motor and manual skills at all ages, both at home and at school, by means of activities such as walking, which has been shown by many studies to benefit health and cognitive activity; the practice of body motion, by accomplishing simple tasks, such as tidying up, cooking, baking, writing - in other words, by broadening the tactile and manual experience that in digital interactions is limited to the use of two fingers; the practice of executive functions every day through sequences of actions aimed at achieving small goals, creating a sort of daily micro projects to be accomplished, reading paper books that - unlike e-books - combine the sensory and manual experience with eye movements; encouraging people to write by hand the grocery list, the study notes, in order not to lose practice of a cognitive function requiring a high level of concentration; encouraging singing, and listening to music in a focused way, as Oliver Sacks suggests in his *Musicophilia*, because listening to music is a motor experience that activates areas responsible both for reproducing and perceiving it; encouraging people to repeat notions out aloud, because this linguistic exercise is a motor experience that enhances the memory and the language, improves the choice of words and reorganizes the mental sequence of notions; promoting drawing, giving free rein to mental imagery, and sharing this experience as much as possible, cherishing social relations, because they are the healthiest food for the mind and the body. Manfred Spitzer said that all the extraordinary things made by humans in history were made using their hands. A teacher or a parent might wonder how they could wean their students or children off their digital devices. The answer lies in the old saying "those who are absent are always in the wrong". We must fill young people's time with emotionally fulfilling experiences, and at the same time teach them that they can use their idle time to reflect or make plans. That they should refrain from using the web as a filler of idle moments, and instead start using it for specific projects or research purposes only. Educational institutions might resume the old way of conducting school research, using posters, pictures and images to be cut out and pasted. This is a cognitive, tactile, proprioceptive exercise - a motor and manipulative exercise involving selection and sequence. An enriching experience that children share with their schoolmates, which enhances their functions and their self-esteem, as well as promoting cooperation and healthy competition. Our brain evolves through our eyes. They vehiculate emotions and learning, since brain plasticity is triggered by changes perceived by the eyes, but cerebral and mental activities can't be understood if separated from the rest of the body.

Education cannot ignore the evolutionary axiom stating that the constant practice of sensory and motor function can't but determine its structure.

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