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Early Childhood Development: The Influence of Digital Technology on Psychological Processes and Mechanisms

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Abstract: Despite the novelty and excitement of the promise that technology will revolutionize education, as it has revolutionized many other fields (medicine, industries), programs in recent years have shown that technology alone does not have the power to change education for the better (Blackwell et al., 2014, para.4). Still, people can do this, if they are willing to learn *how*, *why* and *when*. In other words, first, the devices were introduced and the infrastructure created, then administrators and teachers began to learn how to use it, with support in some countries, without support in others. Would a reverse approach have been more useful? For instance, specializing teachers and subsequently equipping schools with the necessary infrastructure? We are in a situation where there are sometimes early education institutions where there is equipment, but education managers and teachers do not have the full picture of *how* and *when* to use it, and what are the implications of this usage.

Given observations and studies carried out in the school environment, we wonder how equipping kindergartens with tablets and other screen devices would work? What makes digital technology really useful in early childhood education? What should be the motivation for the introduction of digital technologies in early education?

This paper provides psychological and educational benchmarks for the use of digital technologies in preschool educational institutions, as well as in the context of family education.

Keywords: early childhood, psychological mechanisms, cognitive processes, effects of digital technologies, digital technologies in education, digital competences, digital intelligence

Introduction

To highlight the effects that digital technology has on the cognitive development of children younger than 6 years old, we first need a classification of their causes.

First, we can consider a direct source, which involves the child's use of the device, and an indirect source, which refers to exposure to how other family members or close acquaintances use them.

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Thus, the indirect source (in this context) that produces effects on the child's cognitive development is precisely the model provided by the parent, namely their behaviour in relation to digital technology (when, how, how much, why does he use the phone, tablet, TV, video game console) but also of older siblings or other family members or the narrow circle of adults (e.g. the educator). In this case, the child is exposed to digital technology (content, context, duration) and learns a certain pattern of behaviour towards it, through imitation.

A second source is the child's use of a digital device (phone/ tablet/ television/ desktop computer/ laptop). In this case, the interaction with digital technology is direct. This interaction is the subject of interest for the present paper and which I will detail further, the one that the cognitive sciences investigate and the one that, in fact, needs conclusive results to be able to guide children's education. About the first source, psychology has already provided numerous theories and studies that explain its importance and how it works.

We considered it useful to organise the information obtained from the bibliographic research according to the mental process addressed or studied by the researchers. So here are some observations related to perception, representation, memory, thinking, attention, motivation, and imagination. We have also added information about language acquisition and learning, complex processes that build on those previously stated.

1. Perception and Representation

Perception and representation are the first mental processes that mediate the interaction between the child and the environment. Through these cognitive processes the child forms a mental representation of space, time and everything received through the senses: images, smells and tastes, tactile and auditory sensations. Representation is a psychic mechanism that facilitates the human ability to refer to objects in their physical absence. The more the child interacts with the environment through the senses, the richer the representation of an object and space, and can provide meaningful details in the absence of the physical object. Perception plays an essential role in the formation of representation, which is why direct interaction between the child and objects is essential in learning. The motor and sensory centres are very well developed in the first years of life, which is why the child's main need, both physical and mental, is to access the environment through all their senses. The sensorimotor centre activates more when children interact directly with the object. According to psychologist Jean Piaget, this period is characterised by children's need for concreteness and movement. From this point of view, digital activities do not support sensory development, sight, the most targeted of which is the sense that continues to develop until the age of 10. (Tang et. al, 2021, para. 5)

Let's take, for example, the digital alternative of an object, namely its image. Without this yet being concretely explored, what the child receives about that object is only visual and auditory. The sense of touch is not exploited in its depth, but reduced to feeling a smooth, flat, uniform surface. Moreover, the sound and the visual are not interconnected from the beginning on a psychic level, which is why, before the young child can associate the image he sees on a screen with a sound, he needs to make this association in the concrete environment. The relationship with the adults around him shapes the relationship between the sounds he hears, the movement of the lips and the face of the speaker. This is how the child learns to associate a certain sound with a picture.

The same happens with the other senses. If, for example, the child eats in front of a screen (so he will look at something other than what he receives as food), the child will not be able to make associations between the taste, the image, the smell, and the texture of the food he is eating. Visually, he receives information (what he sees on the screen) and through the other senses, other information. Moreover, attention plays an essential role in learning and in this case, attention is captured by the image.

Apart from creating Pavlovian conditioning by associating feeding with watching the content of a screen, thus creating an addiction, the child has not formed at a mental level the correct associations between the information it receives through the senses. Clarity, an essential feature of representations of the world in which the child lives, is lacking.

A study conducted on a group of 847 children aged between 2 and 5 years (Jusienė et al., 2019, para.2), confirmed the unfavourable associations between screen use during meals, daily screen time and consumption of unhealthy food (junk food) during early childhood. Of the parents interviewed, only 44% confirmed that they never use screens during meals.

If at the age of 6 months, the child manages to imitate an action equally well if it is presented in a video recording or live, the same does not happen after the age of 1 year when the *video deficit* appears (Barr, Muentener, Garcia, 2007). Basically, the child does not perceive the content displayed on a screen as real.

Therefore, most studies highlight the importance of the adult's active participation in the relationship with the child as the main factor in their learning and cognitive development.

2. Attention

Attention is a psychic phenomenon of selective activation, concentration, and orientation of psycho-nervous energy to optimally carry out mental activity, with the distinction of cognitive processes. Attention is directly involved in the learning process.

The peculiarity of the functioning of different nervous circuits means that there are practically at least three interruptions per minute of attention to simple stimuli - 8-10s. (Bucur, 2019, p. 9) Thus, in the age range of 1-3 years, the stability of attention is around 10-15 minutes and increases to 20-25 minutes in the next 3 years. Concentration is an attribute of attention, and it keeps developing, being influenced by training, interest and the importance of the activity.

During the first years, the child trains their ability to concentrate with activities that arouse their interest and involve repetition, following a sequence. The structure, clarity, and relatively slow speed of the adult's movement support the development of this type of attention.

The attention most often stimulated by digital device screens is involuntary attention. Maintenance is done through strong, visual and auditory stimuli and feedback markers that validate the child's inputs. However, overstimulation is tiring and does not provide space for the necessary breaks to "decant" the information.

The success of an app is measured in maintaining attention, and stimuli such as those provided by some apps and games make this possible in ways that ultimately lead to addiction.

According to Dr. Michael Manos, director of the Cleveland Clinic's ADHD Assessment and Treatment Centre, children ages 5 and younger who spend 2 or more hours in front of screens are 8 times more likely to be diagnosed with attention problems such as ADHD and others. (Manos apud. Novak, 2021, para. 4) The main two reasons are 1). The intensity and repetitiveness of visual stimulation in a very short time and 2). Immediate gratification. Compared to the virtual world, the real world offers a much slower pace that, for a mind accustomed to overstimulation and instant gratification, no longer holds interest.

The brain operates with two main types of attention: involuntary attention and voluntary attention. As previously mentioned, it is involuntary attention that prevails in the early years of life, while voluntary attention engages concentration and will, being sustained and directed. Digital environments especially act on involuntary attention, which is why excessive training of this type of attention has a negative impact on voluntary attention and concentration.

Another study led by Canadian researchers (Tamana et. al, 2021) showed that 3-year-old and 5-year-old children's use of digital devices for more than 2 hours are likely to meet the criteria for diagnosis with ADHD.

The increase in time spent in front of screens is associated with attention problems, and one of the reasons could be precisely the lack of ability to select the content, the phenomenon of attention not yet being matured enough to be able to function in the case of overstimulation.

Pierre Laurent, former marketing director at Microsoft and Intel and father of three children aged 9, 15, and 17, argued in 2015 (The Guardian, 2015, para. 16) that although you can give your child an hour of screen time per day, content created for kids is specifically designed to keep their attention outside of actual screen time or device use. "There is no intention to hurt the children but there is an intention to keep them engaged, attentive." App and game makers "don't want to give you time to wander off and start using another media product, so they resort to addictive elements," he claims, a finding also made by other mentioned authors, such as prof. Howard Gardner, neurologist prof. Dr. Manfred Spitzer and prof. in cyber-psychology and Europol academic consultant Mary Aiken.

3. Thinking

As for thinking (cognition), it is not automatically logical and can sometimes be misdirected if it is not trained in reasoning. This training begins in early childhood.

A phenomenon associated with overstimulation caused by long-term exposure to digital media is Accelerated Thinking Syndrome (SGA). This is described at length by Prof. Cury and manifests itself in school children and teenagers through agitation, starting discussions out of context, and lack of concentration. Prof. Cury describes this syndrome as having three main causes: the excess of visual and sound stimuli produced by television, the excess of information, and the visually aggressive consumption policy (Cury, p. 70).

Regarding this phenomenon, Prof. Dr. Spitzer claims that "To be able to perceive something so quickly, our visual system must protect itself against overload." (Spitzer, 2020, p. 220). The doctor argues that this is made possible by suspending attention for a quarter of a second, during which automatic stimulus processing processes stop processing other stimuli until the current stimulus is perceived and processed. This leads to the interruption of attention as a protective mechanism against overstimulation.

Multitasking and attention deficit are two of the effects associated with this phenomenon, detailed in the following chapters.

As for the formation of mathematical thinking, essential in everyday life, it starts from the concrete. How is the satisfaction of this need reflected in the child's activity in the virtual space? Does the virtual space reflect the surrounding reality? How do apps and games that parents give to children feed the child's psyche? Just as a healthy and tasty food preparation nourishes the child's body, what children receive through senses and language is what nourishes their psyche in the continuous search for relevant experiences.

Mathematical thinking is based on the sensory-motor exploration of the concrete. The concrete precedes the iconic and the symbol.

Numbers are processed by the brain from 3 perspectives: 1). as a sensory and motor fact related to the fingers and the surrounding objects. 2). As a point there is a line in the parietal lobe 3). In word form in language centres. (Spitzer, 2020, p. 150)

Based on this knowledge, a study was conducted on how the use of fingers in numeracy and mathematical calculation at an early age has an impact on mathematical thinking in adulthood (Domahs et al., 2010, para.20). Two groups of subjects were drawn up, one German and one Chinese, with an average age of 25 years. Why were these two nationalities chosen? In Chinese culture, children learn to count to 10 using one hand, while in German culture, as in most European countries, children learn to count to 10 using both hands.

The experiments aimed to measure the response time in the case of comparing two numbers. The results showed a different reaction time decrease in the two groups of subjects, thus: while the Germans became slower when comparing numbers greater than 5, the Chinese became slower when comparing numbers greater than 10. Clearly, the subjects did not use their fingers to count during the experiments, but the study demonstrated that the use of fingers and counting on fingers from childhood is integrated at the psychic level through representations and decisively influences the ability to operate with numbers and mathematical thinking.

4. Imagination

The child uses creative, intentional imagination (directs all their energy and attention to the creation of works) and makes an original redesign starting from the perceived concrete when making a drawing or a collage. One of the features of imagination is that of being influenced by reality: the child needs the images th at he himself forms with the help of the visual sense.

Imagination is a complex psychic mechanism, difficult to study in young children and yet extremely obvious. Most often this takes the form of a role-playing game in which the child experiences a reality by being the author of the scenario, but also through artistic expression: drawing, dance, and music.

Imagination is a process of distortion of reality. To be able to deform it, a child must master it well enough to manipulate and alter it in a creative, that is, useful way, with the possibility that its products can be anchored in the real, in the concrete.

Creativity is a form of imagining unusual solutions that use available resources in an unexpected way to provide a solution to a given situation. So, creativity is more than combining and recombining digital images/elements usig the available tools.

About the artistic products (drawings, collages, musical compositions) obtained through the use of digital applications, the American teacher and researcher Howard Gardner draws attention that "applications could represent the 'ultimate lock' (Gardner, 2015, p. 143)" and offers the Songwriter Pad application as an example. Thus, the products created by children with the help of applications that offer a set of predefined objects and tools to be used in a certain way, ”are circumscribed by the choices that the designers made when they configured the application” (ibid., p.143). In other words, it is limited, controlled creativity. The raw material provided by the apps limits the possibilities and excludes other possible variants that the child's mind could realise.

From another point of view, imagination also means fantasy and the child cannot distinguish between fiction and non-fiction before the age of 6-7. (Church, updated: 2020). Knowing this, we can understand the situations in which children look for in the real environment that exists in the virtual environment and it is very difficult for them to understand the notion of the unreal. So the virtual can create even greater confusion between what is real and what is not real, as some fantasy stories do. Moreover, a study published in 2015 showed that, unlike adults, young children prefer true stories more than fictional, fantastic ones (Barnes, Bernstein, Bloom, 2015).

Another study mentioned by H. Gardner in his work Generation App (2015), carried out on a group of school children, showed that students who listened to a story on the radio developed more imaginative answers about the continuation of the story than children who watched the story on television and which produced narratives that repeated the original. (Valkenburg & van der Voort, 1994 apud. Gardner 2015). The study highlighted the ” visualisation hypothesis” according to which ”children's exposure to ready-made visual images restricts their ability to generate new images of their own” (Gardner, 2015, p. 144).

5. Memory

Regarding memory, Dr. Cury claims that “*there is no such thing as pure memory. [...] Memory is specialised in making us creators of new ideas*” (2017, p. 136), being the ”reservoir of imagination” (Zlate, 2009, p. 178).

Whether we are talking about working memory or long-term memory, the construction of this reservoir is constantly made based on childhood experiences. Some of these experiences go directly into the *mneme*, the unconscious memory that although we cannot directly access, it guides the reactions, reflexes and behaviour of each individual.

Moreover, memory is directly influenced by emotion, emotion being the one that encodes certain information. They say people won't remember what you said but they will remember how what you said made them feel. In other words, memorization is carried out directly emotionally, it directly influences behaviour, without the reason being able to be explained, made aware.

Moreover, memory supports learning, being a mechanism that extracts from the child's experience everything relevant to encode information that is then transformed into knowledge through the process of thinking.

Take object learning for example. In order to highlight how the manipulation of objects, thus the activation of the psychic motor centre, supports the learning of objects, the German researcher Markus Kiefer and his colleagues (Soden-Fraunhofen et. al, 2008 apud. Spitzer, 2021, p.156) carried out a study on a group of 28 students from Ulm. They were asked to assimilate conceptual notions about 64 "noobjects" (invented objects), namely image, name, category, shape, and particularity. By isolating different characteristics of the "new objects" in turn, the researchers were able to highlight the interdependence between the ability to process newly acquired content and how it was assimilated. In the case of the students who manipulated the newly learned objects, the motor brain activation pattern entered the conceptual structure. In other words, how something is learned directly influences how it is remembered and accessed later. The reduction of the sense of touch and manipulation when using a mouse and its associated click or an action of tracing a finger on a digital screen, affects the memorization of objects viewed on these devices, their learning mode. So, "he who is about to know the world must necessarily turn to the real world." (Spitzer, 2020, p. 156).

6. Self-Control and Volition

As for self-control, it is not an innate ability, the child has the potential to develop it throughout the first years of life. "Kindergarten is, in terms of neurobiological development, pure frontal lobe training." (Spitzer, 2020, p.211)

Along with self-control, working memory and mental flexibility are brain functions that facilitate attention, focus, and learning.

According to an international study conducted on a group of 416 newborns, regular exposure to digital content at the age of 4 months could be correlated with a lower level of inhibition ability at the age of 14 months. (McHarg, Ribner, Devine, Hughes, 2020)

"Self-control always equates to the inhibition of reflex behaviour" claims the neurologist Spitzer (2020, p. 209), and the willpower is the essential psychic function in acquiring self-control. This is involved both in inhibiting actions that harm oneself and others (inhibitory will) but also in mobilising resources to succeed, to perform a difficult task or to overcome an obstacle.

How does exposure to digital content influence the development of volition?

Take, for example, solving a puzzle. In a digital application, moving pieces is done by simply dragging the pieces across the surface of the screen. Regardless of their shape, their position in the game, thickness, texture, and tactile sensation are the same. The effort is often reduced by the drawing effect of the piece or the visual effect before placing the piece when it is close to the space where it would fit. The action is much simplified.

In the concrete environment, completing a puzzle requires much more effort, skill, and coordination of movements and takes much longer, requiring active will, which helps the child to overcome the obstacle and complete the puzzle. Therefore, a greater effort trains more willpower and consequently also perseverance (formed based on previous experiences in which willpower led to success) but also resilience (the ability to bounce back after a failure).

7. Motivation

If we stick to the example of the puzzle, we notice that the way to solve it, as well as other digital games, changes the functioning of motivation, orienting it from the inside to the outside.

The child usually receives, in a virtual game, an external gratification that overlaps and, in many cases, supersedes the expression of their own joy for success. Gratification and success play a decisive role in building motivation. Intrinsic motivation is that type of motivation that comes from within the person, is self-fuelled to support the self-fulfilment of one's own needs and desires, and focuses on action. For this reason, this type of motivation supports the individual's independence of thought and action.

In contrast, extrinsic motivation is generated by the reaction of the environment or others (other children, parents, teachers) to an individual's success. In the case of digital devices, the feedback system they provide (sounds, vibrations, or visual effects) emulates external validation and undermines self-evaluation, directing motivation toward the outcome rather than the process.

Take for example the tower building game.

When it is built from concrete pieces, made of wood or other material, the visual harmony works as an error control, the child alone validates whether it fits or not, rethinks the way of placement, relies on their thinking. In this case, the child has the opportunity to enjoy their success, the concrete activities offering him numerous opportunities to improve what he does, without setting certain standards.

In this case, motivation is stimulated on the one hand by the tendency to perfection, and on the other hand by the anticipation of satisfaction and the moment of success.

In the case of a digital matching game, the validation is programmed automatically, and the self-assessment is replaced by the standard application/game validation. Thus, the achievement of a result is encouraged, and less the process of achieving it.

8. Language

Regarding language, the studies carried out so far have highlighted the speed with which children learn to speak in the first months of life, something that can also be observed in everyday life, both by parents and teachers.

Seeking to better understand how language acquisition works, researchers have conducted several studies that have identified a "video deficit effect". Practically, they were able to highlight the fact that up to 3 years old, children learn and develop communication skills much better through interaction with a human being than through interaction with an electronic device.

Moreover, in the case of second language acquisition, a study has shown that this is facilitated exclusively by direct interaction between a native speaker and the child. In a study conducted by the German researcher Kuhl and his collaborators (2003), two experiments were conducted on groups of 16 children aged between 9 and 10 months. In the first experiment, a group of children were exposed to 12 sessions of 2.5 hours of Chinese (Mandarin) in which a native speaker read for 10 minutes and then played for 15 minutes, with the adult making eye contact with the children. The second group, the control group, was exposed to the same amount of time and type of activities as group 1 but conducted in English, their mother tongue. In total, the children spent 25 hours in the company of the natives. After one year, the level of recognition of Chinese syllables in both groups was measured and, obviously, the first group recorded an average recognition rate of 65.7%.

In the second experiment, the conditions from the first experiment were repeated (the same number of children, the same age, the same time spent in the experiment), but the way of exposure was changed. Instead of native speakers, video recordings of native speakers, a video reproduction of the activities from the first experiment, were used for one group, and audio recordings were used for the second group. After a year, the researchers measured the level of recognition of Chinese sounds in the two groups of children and found that electronic, audio-video, and audio media did not lead to learning (para. 19). In conclusion, direct and immediate interaction with a native speaker at the age of 9-10 months is sufficient to ensure the learning of a foreign language and the use of audio-video devices does not produce learning in this case.

Private speech, as defined in the Anglophone specialist literature, or children's *soliloquy*, is a phenomenon that appears around the age of 3 and manifests itself as a verbal expression of internal dialogue. Children talk out loud without addressing anyone in particular. This behaviour can be observed in moments of individual play, both in role-playing games and in games of another type or with other objects. In children, soliloquy is a form of self-regulation also used in problem-solving activities.

An experiment carried out on a group of 5-year-old Italian children, 16 of whom were girls (Bochicchio et al., 2022) showed that the same activity carried out in the concrete environment and then in the digital environment, had a different impact on how children use soliloquy during play. The children talked to themselves as they built the tower using concrete materials while building the tower through a digital app greatly reduced the extent of the monologue. The researchers added that it may be that the parents who, by associating the screen with "quietness", have induced this behaviour in the children.

The Russian psychologist L. Vygotsky was the first to write about the soliloquy 36 years ago. He believed that language and thinking are two separate systems at birth and that come together around the age of 3 when they become interdependent: thinking becomes verbal, and speech becomes representational. (McLeod, 2023, para. 69). According to his theory, the soliloquy is essential in the cognitive development of children and its purpose is not communication but self-regulation, the external monologue becoming the inner voice after the age of 7.

This study could contribute to the understanding of the link between DT use, inhibition of young children's soliloquy, and changes in self-control ability from preschool ages.

From the point of view of language, one of the relevant aspects at this age is vocabulary. This is the easiest to highlight at a young age, observed and quantified. The number of words, correctness of expression, and complexity of utterances reflect the level of language development at this age.

A government-funded and nationally representative longitudinal study called Growing up in Ireland studied the cognitive, social, and emotional development of 9,001 Irish children aged 9 months to 5 years between 2008 and 2013. According to researchers, the number of 3-year-olds who use at least one screen device daily has increased by 18% over the past 10 years. (Beatty et al., 2018, p.1) Based on interviews with parents and visits to educational institutions, researchers were able to find out that only 2.6% of children aged 5 did not have access to screen devices,

and 56.4 % of children of this age were involved in mixed activities such as movies and TV programs (ibid., p.5). Also, children who used digital devices to access educational content spent less time on average than other children who used the same devices for entertainment On vocabulary tests, children who played video games scored the lowest, compared to the other children (ibid., p.7). In conclusion, the type of activity has a greater influence on the development of children's vocabulary compared to the time spent in front of a screen, which contributes to shaping the importance of the content offered on digital media.

A study conducted by the American psychologist Daniel Anderson, today a professor emeritus of the University of Massachusetts, was conducted in 2005 and led to the definition of the concept of "video deficit" (video deficit) present in children younger than 2 years old. TV programs/videos defined as "educational" (e.g.: Baby Einstein) and shown to children during the experiment did not produce learning.

A study published in 2019 and carried out by the American researcher Hutton and his colleagues in partnership with the Educational Neuroimaging Center on a group of 47 babies (average age 7 months) highlighted an association between the use of digital content by children for a while longer than indicated by the AAP, i.e. more than 2 hours over the 1 hour/day recommendation, and the microstructural integrity of brain white matter that supports language and emerging literacy skills in preschool children. (Hutton et. al, 2019a, para. 28)

In another study by Hutton and his colleagues, published in 2019 (Hutton et. al, 2019b, para. 1), the authors looked at how the brains of 27 children between the ages of 4 and 5 work. years and a half, in 3 different but comparable situations. In the first situation the children listened to the audio recording of a story (audio), in the second situation they watched a story illustrated in a book and read by an adult and in the third situation they watched an animated story. Each of the 3 moments lasted approximately 5 minutes and was followed by a discussion session about the content of the story. Regarding the level of understanding of the story, the illustrated version and the audio version produced similar levels of understanding while the animated version produced a lower level of understanding than the other two. In terms of MRI imaging, it showed that the most associations between attention, visual perception and imagination, and language are made with the picture story. The illustrated version of the story particularly activated visual perception and imagination. In conclusion, while audio stories develop the imagination, picture stories provide an integrated learning experience that engages both language and attention and visual perception.

According to Glen Steele, professor of paediatric optometry at Southern Tennessee College of Optometry, USA, "a child's ability to see when an adult is looking at an object and try to reach for that object" has a decisive influence on vocabulary development. He claims that a child who makes eye contact with their parent often enough to identify the objects at which the parent is looking influences him to know about 335 words by the age of 18 months compared to a child who does not follow their parent's gaze and who will only be able to identify 197 words by the same age. (AOA, 2019, para. 7) He argues that the 1990s rule, when doctors recommended 20-second breaks for every 20 minutes of TV, no longer works today when children hold their phones and tablets very close to their faces, instead this recommends compliance with WHO indications and frequent breaks in the exposure of young children to digital content.

9. Physical Development

It is important to mention, without being the main theme of this paper, that the psychological approach to the impact of technology on children is currently seconded by the approach from the physiological perspective of this phenomenon, namely how the use of digital technology impacts physiological processes both at the level of the brain as well as from the level of psychomotor development.

Of course, studies on changes at this level could not be carried out on very young children, which is why the mentioned results refer to the next stage of development, of school children.

A study carried out in 2015 (Takeuchi et al., apud. Gottschalk, 2019, p. 14) demonstrated that watching TV programs affects psychomotor development, as children who regularly watch TV programs are much less involved in physical activities, without that this study can generalise the results. (given a small sample and other limitations)

In another study carried out in 2015 by Ciccarelli (Ciccarelli, M. et al., p.1), he showed that the use of computers and devices with screens (phones, tablets) involves the adoption of positions that are not beneficial to the body, which depending on the duration, can lead to the appearance of dysfunctions in the skeletal-muscular system, especially in

the area of the neck, trunk and upper limbs. All the more so as the development of the body in children is strongly accelerated in the first 6 years of life. The tool used to determine the risk determined by the use of ICT devices by children is RULA (Rapid Upper Limb Assessment) and the score obtained in the case of 11 children was greater than 2, which means an existing level of risk. Unfortunately, however, this tool, widely used in workplace ergonomic assessment for adults, does not include unconventional positions adopted by children during play, which is why the results remain at an exploratory level.

Conclusion

For a responsible use of digital technologies in early childhood education, at least two conditions should be met beforehand.

The first condition would be the scientific substantiation of how digital technology can be used beneficially in the education of preschool children.

The second condition consists of an adapted pedagogical training of teachers regarding the constructive use of digital technologies for children's development.

However, the development of digital technology and its rapid penetration into the professional and personal space makes this unlikely, and the expectation is that teachers will use their knowledge, acquire digital technology skills, and become creative in their use of digital technology in children's education. Could this approach better support young children's digital literacy? But how?

On the one hand, the omnipresence of digital technologies gives rise to the need to know how to relate to it, to extract the best it can offer. But what exactly, research on the human mind will reveal to us in time. For the moment, caution and limitation are the two principles circulated by government institutions, and the trend is to encourage digital literacy, from adulthood to early childhood. On the other hand, companies promote products for educational purposes, without this explicitly expressed purpose being scientifically supported.

Faced with these new challenges, teachers have the responsibility to support the adaptation of children to the world they live in and to give a new direction, an educational one, to digital technologies. To create activities where digital technologies are subordinated to education and not the other way around. To seek balance and stay in constant contact with new research, to continue to question and learn. Therefore, we are talking about a new competence of educators and a new behaviour, in the classroom and in partnership with parents.

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