

A REVIEW OF STRESS ON STUDENTS WITH ADHD. THE ROLE OF ICTS & MENTAL INTERVENTIONS TO IMPROVE PRODUCTIVITY

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Abstract

The Attention Deficit Hyperactivity Disorder (AD/HD) is the most common neurodevelopmental disorder of childhood and one of the more widespread chronic diseases that affect children school age, based on the DSM-IV. This study focuses on the influence of stress to the kids suffering from ADHD and the importance of other elements on it. This particular study was based on articles in scientific journals, with the purpose to investigate some of the factors that affect positively or negatively in the exacerbation of anxiety on children suffering from ADHD and how the prenatal and parental stress affects this condition. The results have shown that the environmental factors, nutrition, hormones, neurotransmitters and alternative techniques are directly related with the characteristics of the disorder and the ways of how to improve it. In the light of these findings, we came to the conclusion that we can intervene to the deficits of mainly socio-emotional functions through the above factors.

Key Words: AD/HD, Attention Deficit Hyperactivity Disorder, anxiety, stress, nutrition, sugar, neurotransmitters, parenting stress, maternal stress, anti-stress techniques, physical exercise, meditation, yoga, neurotransmitters, gaming.

1. Introduction

The Attention Deficit Hyperactivity Disorder (AD/HD) with prevalence 3-5 % over the general population, is the most common neurodevelopmental disorder of childhood and one of the most widespread chronic health conditions that affect the school age children (American Academy of Pediatrics, 2013).

The Attention Deficit Hyperactivity Disorder (AD/HD), in accordance with the Diagnostic and Statistical Manual of Mental Disorders DSM-V of 2013, is a biological developmental disorder where the individual presents difficulties on three developmental levels in relation to his peers. More specifically the individual presents difficulties on the fields of attention deficit, impulsivity and/or hyperactivity. It is a common mental disorder of children and adolescents, that affects about 63 million children and adolescents worldwide (Polanczyk, Salum, Sugaya, Caye, & Rohde, 2015). Depending on which symptom prevails three subtypes of AD/HD are distinguished (White and Buehler 2012; Daliana and Antoniou 2016): The Careless Type, where the attention deficit prevails. The Impulsive Type, where the hyperactivity and/or impulsivity prevails. The Combinatorial Type with the combination of all the above.

The Drigas and Driga (2019) report that the Attention Deficit Hyperactivity Disorder (AD/HD) is characterized by a lack of attention and impulsivity. The AD/HD is a complex and multivariate disorder. First of all the nutrition habits of a pregnant woman are decisive for the baby. More specifically, smoking and alcohol

consumption during pregnancy poses risks for the development of the fetal brain. Another factor related with this disorder is that preterm birth has been associated with neurological and cognitive risks. In addition to this, low birth weight has been also associated with AD/HD. The socio-economic factors, the excessive use of video games are also involved in increasing the chances of developing symptoms of disorders. Ostberg & Hagekull (2000) say that there is a variety of characteristics of the child that has been shown to increase the level of anxiety experienced during the upbringing of children with ADHD. For instance, children with AD/HD present related difficulties such as antithetical behavior and aggressiveness, and these related difficulties have been shown to exacerbate the anxiety of parents.

AD/HD is usually hereditary, nevertheless, the exact genetical associations are yet to be determined. It has been found that children with parents who suffer from AD/HD, have more than 50% chance to inherit it. If one of the children in a family has been diagnosed with AD/HD, the rest of their siblings, present or future, have more than 30% chance. The genetic basis of the disorder is the main basis for its appearance. Other than that, there are further developmental, environmental and psychological factors that can create the situation and magnify it. AD/HD can be a result of the combination of genetic factors and environmental influences. Many of the environmental factors can be controlled and in this way they contribute significantly to the reduction of the intensity of the disorder (Drigas and Driga, 2019).

1.1. Stress

According to the World Health Organization, the issue of mental health and the disorders related with anxiety is the largest general cause of early death in Europe and that's why is essential to learn how to deal with it. The last years, the research that concerns the technology and means on how to decrease the stress, many mental health applications have been developed to manage stress (Anagnostou & Drigas, 2022).

Stress defined as the reaction of the body in any strong, mental or emotional stimulus, internal or external origin. Happens every time an individual faces a situation, on emotional or physical level, that overcomes his ability to cope with it. Stress is stagnant and creates restlessness that leads to physical and psychological discomfort. Anxiety disorders always include fear emerging from an imminent threat (Alexopoulou, Batsou & Drigas, 2020).

Controlling emotions in stressful situations is an essential aspect of mental health. On the other side, acute stress effects the control of prefrontal cortex, with a result probably the loss of the ability to control emotions. To reduce the threat, the stress response activates a number of defense systems, including the communication with hormone messenger. Everyday events are considered as stressors, in relation to the threat value of the individual and estimates of response resources. This is the idea of psychological stress, to which one's physiological response to an incident can be changed by previous experience (Bravou, Driga & Drigas, 2022).

Dopamine, adrenaline (epinephrine) and noradrenaline (norepinephrine) are catecholamines present at specific sites in tissues. Epinephrine is found mainly in the adrenal medulla and after it is released into the bloodstream, works primarily as a hormone in distant target organs. Norepinephrine acts as a neurotransmitter locally in the performing cells of the smooth muscles of the vessels, adipose tissue, liver, heart and brain. It is found mainly in the sympathetic nerves of the peripheral and central nervous system. Dopamine has two functions: it is a precursor to noradrenaline and is believed to be a neurotransmitter in the parts of the brain that are involved in the coordination of motor activity, where it is found (Bravou, Driga & Drigas, 2022).

2. Method

The purpose of this research is to investigate through a literature review the role of hormones, habits, lifestyle and improvement techniques in the symptomatology of ADHD in childhood / adolescence. This research consists of a literature review whose bibliography is articles of international scientific journals with few exceptions, mainly from 2000 to 2021. The keywords were AD/HD, Attention Deficit Hyperactivity Disorder, anxiety, stress, nutrition, sugar, neurotransmitters, parenting stress, maternal stress, anti-stress techniques, physical exercise, meditation, yoga, neurotransmitters. The search engines that were used were Google Scholar and Research Gate.

3. Various factors affecting stress and ADHD

According to Baker et al., (2020), parabens, which are used as preservatives in foods and personal care products, are detected in almost 100% of human urine samples. Exposure to parabens is associated with DNA damage, male infertility and endocrine disruption in adults, but the effects of prenatal exposure are unclear. In part, this is due to the insufficient evaluation of exposure to the mother's urine, which can only reflect the exposure of the mother, and not of the fetus.

The association between dietary exposures and ADHD has been investigated and some studies have identified adverse effects from higher sugar intake.

The research of Lee Blunden, Milte and Sinn (2011) comes to examine any interdependence of diet, sleep and symptoms of ADHD. The conclusion of the study was that children whose sleep is disturbed consumed more fat (monounsaturated and polyunsaturated), energy, carbohydrates and sugar. More specifically, of the sleep subscales, sugar consumption was significantly associated with the prediction of night sweating and with breathing disorders during sleep.

Chronic and child stress is involved in the development of ADHD and ADHD is largely comorbidity with anxiety. Similarly, inflammatory diseases and a pro-inflammatory condition have been associated with ADHD. However, while several papers have studied the association between peripheral inflammation and stress in emotional disorders such as depression or bipolar disorder, few have investigated this association in ADHD (Saccaro et al., 2021).

Neurotransmitters are called biochemical compounds, which serve to transfer information from one neuron to the next. These include dopamine and norepinephrine, which help us think, focus our attention and control our behavior. The function of these substances is so important, suffice it to mention that this reaction is processed by drugs administered to treat ADHD, increasing the amounts of these substances in the brain in a chemical way. (Τζικόπουλος, 2017).

Since an underactive dopamine may be responsible for ADHD, it is important to consider the similarities and dissimilarities in working memory between ADHD and Phenylketonuria (PKU), an inherited metabolic disorder that has been shown to represent dopamine deficiency. Both dopamine and norepinephrine are important regulators of the attention system. The availability of dopamine has been found to affect some but not all cognitive functions mediated by the prefrontal cortex (Sergeant et al., 2003).

According to Saccaro et al., (2021) it is interesting that mother anxiety during pregnancy increases the risk of subsequent children with ADHD. In turn, ADHD, which is a neurodevelopmental disorder, exposes patients to stress in early childhood. In fact, ADHD symptoms potentially expose patients to conflict, neglect, or physical and emotional abuse in social, school, and family environments. Some studies have

found a prevalence of behavioral problems in children associated with ADHD as a function of prenatal stress. (Rodriguez, 2005).

The study by Rodriguez, Bohlin, & Lindmark, (2000) was intended to prospectively investigate whether reports of smoking and stress during pregnancy predict symptoms associated with ADHD in 7-year-olds, while addressing specific methodological limitations of the past. First, because smokers tend to smoke more under pressure (Epstein & Perkins, 1988) and perceived stress increases the likelihood of smoking continuing during pregnancy.

In 2006, a study was conducted on a population of 982,856 children, aged 6–19 years, born over time and residents in Sweden. The study population consisted of 982,856 children born during the period (week 37-41) in the births of the years from 1987 to 2000, according to the Swedish Medical Register of Birth (SMBR). The results showed that smoking during pregnancy has a strong relationship with ADHD in the offspring of the general Swedish population, but this risk is mainly explained by genetic and socio-economic confusions (Lindblad and Hjern, 2010).

Crnic and Acevedo emphasize the "daily parental sufferings" and describe them as routine responsibilities of care and upbringing of children that parents may, in the form of chronic demands, find disturbing and frustrating. High levels of daily parental suffering have been shown to be associated with lower life satisfaction, more negative mood and emotion, and increased maternal discomfort. When considering the possible effect of these daily stressors on parents, it is notable that Crnic and Greenberg (1990) found that daily parental sufferings are even more stressful for parents than important life events (Johnson & Reader, 2002).

The purpose of the Leitch et al. study (2019), was to investigate the anxiety of Australian parents of children with ADHD who identified themselves as stressed, using a qualitative methodology aimed at identifying the needs of parents to inform about future interventions designed to support parents and ultimately their children. Thirteen parents of children with ADHD participated in two focus groups. Parents attribute their high anxiety to their children's behavior, unfulfilled needs for support and social stigma. Parents are asking for support to be able to cope and appear to represent a clinical population that needs mental health care and support.

4. Antistress and therapeutic techniques in ADHD

In recent years, there has been an increase in the incidence of ADHD in children and adolescents. Many learning and behavioral problems are associated with this disorder as a result of difficulties in cognitive and metacognitive functions. According to Drigas et al. (2021), only when individuals develop these functions can they integrate into the social environment. Skills such as self-awareness, self-regulation and self-control through inner attention can help children develop alternative strategies to manage their cognitive deficits and adapt to many different environments. With the rapid development of science, several medical and psychological methods for the treatment of ADHD have been proposed, which have contributed significantly to the control of symptoms (Doulou and Drigas, 2022).

4.1 Playtherapy

Some studies have shown that when children participate in game sessions, they feel very happy, and these feelings lead to great attention and accuracy in various activities. Play therapy also helps them spend some of their energy. This energy expenditure leads to a decrease in their impulsivity and over activity during the rest of the day (Doulou and Drigas, 2022).

Also, research by Barzegary and Zamini (2011) studied the effects of play therapy in children with ADHD. Numerous studies have shown that play therapy is an ideal method for the emotional and social problems of children with ADHD (Braton, 2005), while another study suggests that play therapy enhances the control of their impulsivity (Pankespp, 2007).

In the research of Barzegary and Zamini, (2011) children were 7 to 8 years old and attended play therapy in ten sessions (three per week). The task was to pay full attention to an activity (for example, painting) until they heard a bell. With each distraction they would lose a coupon. According to the results, attention deficit hyperactivity levels were lower in the experimental group, suggesting that play therapy can improve the symptoms of the disorder.

Robinson et al.'s study (2017) used a multi-baseline design of a case among participants to investigate the effects of child-centered game therapy on hyperactivity/impulsivity and carelessness in 3 first-grade students. Students participated on average in 3 sessions each week for 6 weeks, for a total of 18 sessions. The results showed that there was a small amount of effect for CCPT on ADHD behaviors.

The purpose of this study was to evaluate the effectiveness of short-term play therapy for children in reducing the symptoms of ADHD. Six children aged 7-10 were selected with ADHD. Participants received short-term play therapy. Each participant received 10 intervention sessions, and the follow-up phase was conducted after three months. According to the results, short-term play therapy for children can be used as an appropriate intervention in reducing the symptoms of ADHD (Hashemi et al., 2018).

4.2. Meditation

Meditation turned out to be a powerful method of combating ADHD. During a study in several adult and adolescent patients who attended a 2-month mindfulness course, the results were very satisfactory. Patients were attended before the course and after its completion. In the end, there were significant improvements in ADHD symptoms and performance (James et al., 2018).

Another study had children aged 11-14 to practice the technique of transcendental meditation at school. A meditation exercise took place twice a day in their curriculum under the guidance of teachers who had previously been trained by specialists in this technique. The students were tested and evaluated for three months. Statistical analysis of the results revealed that stress and anxiety levels were significantly lower, while ADHD symptoms and executive function improved drastically (Grosswald et al., 2008).

In addition, a recent study by researchers at Michigan University of Technology with 14 participants shows that even a single meditation session can positively affect cardiac function as well as psychology. The researchers measured anxiety, a week before and a week after meditation, using the Beck Anxiety Inventory (BAI) and conducted cardiovascular tests measuring heart rate variability, blood pressure rest and pulse analysis (Durocher, 2018).

This study evaluated the effectiveness of an 8-week mindfulness training for children aged 8-12 years with ADHD and the parallel conscious education of parents for their parents. 22 families participated (16 boys, 6 girls). The treatment is carried out in groups of 4-6 children and parents and consists of 8 weekly group sessions lasting 90 minutes. Children's ADHD symptoms, as assessed by parents, were significantly reduced after training as well as the symptoms of carelessness and hyperactivity of parents equally decreased (van der Oord et al., 2011).

Intelligence-oriented meditation (MOM) is a self-regulating training used for attention and behavioral problems. With its focus on attention, MOM is a promising form of training that gains empirical support as a complementary or alternative intervention for attention deficit/hyperactivity disorder (ADHD). Twenty-five children with ADHD aged 7–11 years with behavioral and emotional difficulties, depressive and anxiety symptoms participated in the survey, participated in mom (15) or EEP (10) 3 times a week for 8 weeks, participated in the training. The results documented that MOM training promotes changes in neuropsychological measures and certain behavioral symptoms, pointing to it as a promising tool for improving the cognitive and clinical manifestations of ADHD (Santonastaso et al., 2020).

4.3. Yoga

Complementary and alternative medicine therapies including yoga are commonly used in children with ADHD, but little is known about the effectiveness of these treatments. Yoga requires long periods of concentration and is therefore supposed to reduce attention deficits. In addition, yoga can create a state of calm and satisfaction that is missing in patients with ADHD (Lange et al., 2014).

The research of Samantha, Cohen, Danielle, Harvey, Rebecca, Shields, et al. (2018), studied the effects of yoga on attention, impulsivity and hyperactivity in preschool children with ADHD. The researchers hypothesized that engaging in yoga for 6 weeks would lead to improvements in the symptoms of ADHD (Doulou and Drigas, 2022).

Field's research (2012) comparatively studied a yoga group with an African dance group, the yoga group had less stress as well as lower cortisol levels.

The present study aimed to investigate the role of yoga as an alternative intervention in ADHD. The research took place at the Shiraz Psychiatric Institute. The children who took part were 40 boys and girls 9 to 12 years old. The results showed that yoga leads to positive change in children with ADHD and leads them to the regeneration of their emotions and behaviors. Yoga offers them to decongest the muscles from stress and anxiety, they build their endurance and energy but also they learn to better manage their emotional and behavioral difficulties (Abadi and Venkatesan, 2008).

The study of Chou and Huang (2016) that took part in forty-nine participants of about 10 years of age joined a group that did yoga exercises and another control group. Participants received yoga for eight weeks (twice a week, 40 minutes per session). The findings suggest that alternative therapies can act as complementary interventions for children with behavioral problems.

In a psychiatric unit, 20 children aged 5 to 16 years with ADHD received yoga daily during their stay in this unit (on average there were 8 sessions). Research results have shown that yoga is achievable in this disorder and can be used as an adjunct therapy (Hariprasad, Arasappa, Varambally, Srinath & Gangadhar, 2013).

The study included young people (ages 5-17) diagnosed with ADHD. Preliminary findings suggest that yoga, mindfulness, and meditation may be beneficial for young people with ADHD, but extensive research is needed to validate the effectiveness of these interventions. In addition, yoga has also been shown to reduce symptoms of anxiety and depression in a number of populations by increasing the regulation of the sympathetic nervous system and the hypothalamic-pituitary-adrenal system (Chimiklis et al., 2018).

A study by Harrison et al. investigated Sahaja's techniques. Parents and children participated in a 6-week program with clinic sessions twice a week and regular meditation at home. Children described benefits at home such as improved sleep

patterns and reduced stress, and at school including improved concentration and reduced conflicts, and parents reported feeling happier, less stressed and more able to manage their children's behavior (Lange et al., 2014).

The goal of this study was to evaluate the use of yoga exercises as an adjunct therapy to pharmacological therapy to reduce the symptoms of ADHD's lack of behavior and attention deficit in boys. The participants were 11 boys aged 8-13 years. a results showed a change in the alternation of emotions and the reduction of competitiveness. (Jensen and Kenny, 2004).

4.4. Body exercise

The goal of this study is to investigate the effects of a moderate to high intensity physical activity program on physical fitness, cognitive functions, and behavior associated with ADHD in children with ADHD. A total of 21 participants participated in the study. He was hired by a specialized ADHD clinic of the Rivière-des Prairies Hospital and by a local school. The findings show that participation in a physical activity program improves muscle abilities, motor skills, behavioral reports from parents and teachers, and the level of information processing. A structured physical activity program may have clinical significance in the functional adaptation of children with ADHD (Verret et al., 2012).

The purpose of the study is to analyze the preferences for physical activity in children with ADHD. A total of 103 children diagnosed with ADHD (54 boys and 49 girls) took part in the study with a mean age of 9.5 years (ranging from 7 to 10).Physical education classes provide an opportunity to "accept" to some extent their overactivity, but they need patient and understanding help to slow down and calm, relax and regulate their emotions (Ružbarská and Chovanová, 2014).

The Ziereis and Jansen study (2014) involved a total of 43 children with ADHD (32 boys and 11 girls) aged between 7 and 12 years. After the 12-week intervention period, several measures of the experimental groups improved significantly over time. These findings support the hypothesis that long-term physical exercise has a positive effect on the executive functions of children with ADHD, regardless of the specificity of the exercise. The results showed that regular physical exercise can be used as a complementary or alternative non-pharmacological treatment for ADHD.

The present research was intended to examine physical activity in boys with ADHD and in boys without ADHD. 12 boys (with and without ADHD) aged 9 to 12 years took part in the procedure, 6 of whom had a clinical diagnosis of ADHD. In addition to their physical condition and the effect of exercise on it, it was not investigated whether it can help in the psycho-emotional state of the child with ADHD and whether physical exercise can improve the symptomatology of ADHD (Harvey et al., 2009).

4.5. Neurofeedback

Lubar was the first to apply EEG biofeedback to a hyperactive child in 1976 and found improvements as the SMR application enhanced motor inhibition.NF aims to improve the self-regulation of brain activity using a brain-computer interface. Studies have shown that neurofeedback reduces inattention, impulsivity and hyperactivity that are the hallmarks of ADHD and is as effective as stimulant drugs in controlling ADHD symptoms (Vlachou et al., 2022).

Neurofeedback accompanied by other methods can contribute to emotional balance and postcognitive development. For example, neurofeedback combined with training in metacognitive strategies was effective in students with ADD, since

attention can be trained as a metacognitive and conscious process. In addition, mindful thinking exercises have been found to enhance inner attention (Drigas and Mitsea, 2020).

5. The role of gaming in ADHD

Technologies like video games have become very popular not only with the young generation but also with older people. The video game industry has seen rapid growth over recent years, as has the interest in the influence of video game experience on people's daily life. The study focuses on a novel approach to training Visual Working Memory (VWM) through the use of video games and examines research evidence concerning whether video games can serve as a vehicle for promoting the development of cognitive skills and especially memory and attention (Kefalis et al., 2020).

Yanguas et al. (2021) designed a video game using virtual reality (VR), which included a gamified chess version called "The Secret Trail of Moon" (TSTM). Chess is a game based on simple rules but requires a high cognitive level that includes among others attention, executive functions, and memory (Song et al., 2020; Langner et al., 2019). TSTM aimed to create an innovative and motivating tool for the cognitive therapy of patients diagnosed with ADHD. This video game consists of 6 work areas. Each area is designed to improve a different area of disability in patients with ADHD: attention, working memory, planning, spatial capacity, impulse control, and reasoning. The video game's innovative approach is the usage of chess as a main feature. In TSTM, chess appears in three different forms: A) As a work area, which consists of chess lessons and exercises B) As a central theme of the work area, where the elements of the chessboard and its pieces are used for cognitive exercises, not needing however to know the rules of chess. For example, in the "Smasher" game the player must pay attention to press the X button on the game controller whenever the "pawn-horse" sequence appears. C) As part of the video game plot. For example, the player is in a forest with chess elements who narrate the history of this particular world. During his journey, along with the animals that accompany him, he will unlock information about the relationship between the forest and chess. The ultimate test of the video game is to play a game of chess against the enemy. The results showed that TSTM was fun, understandable, easy to use, and with appealing graphics, resulting in adequate participation of most players. Also, the patients in the TSTM intervention group improved their executive functions more and had fewer undesirable behaviors than those in the online chess intervention group or in the control group (Yanguas et al., 2021).

Yang-Kun et al. (2020) used virtual reality games as means of intervention for attention, abstract reasoning, and complex information processing in children with ADHD. This study includes two stages: In the first stage, semi-structured interviews were conducted with psychotherapists and physiotherapists in order to understand the treatment methods for children with ADHD and to evaluate the difficulties so as to develop guidelines for what games to select.

In the second stage, the virtual reality game console HTC VIVE (HTC, Taiwan) was used to develop a 3-month, three-times-per-week training program for children with ADHD. The study involved three children aged 8-12 years, diagnosed with ADHD but without any other illnesses or disorders and who had not previously received any VR-based training. The results showed that the participants' scores in the five attention exercises improved particularly after the experiment. One participant improved his abstract reasoning and information processing, while the other two

showed reduced performance. Participant A made fewer persistence errors, while participants B and C did not improve their performance in this area.

Sonne et al. (2016) designed ChillFish, a breath-controlled biofeedback game for children with ADHD. ChillFish is controlled by the player breathing into a sensormounted LEGO fish. Breathing exercises can help children with ADHD control their stress level. For the pilot study, 16 adults aged between 25 and 41 were recruited. The result showed that the game challenge of balancing engagement and relaxation in physically controlled games for children with ADHD can make a game be calming and sustain their attention (Sonne and Jensen, 2016).

Ochi et al. (2017) conducted a pilot study and they developed a neurofeedback game for attention training in adults. The participants were 17 adults separated into two groups of high risk and normal based on their initial assessment of ADHD symptoms. The game used a BCI system to detect the attention levels of players from their brain activity measured by a dry electrode played at the forehead in the right prefrontal lobe area. When the player had a low attention level the background of the game slowly dimmed to black and left the field of view only in the center of the screen. This strategy helps the player to focus on a small area of the game and regain his/her attention. Their finding suggests that neurofeedback training could be effective as an alternative treatment for ADHD, because the attention level, the time retained at elevated levels and the time user used to refocus has improved for the high risk group.

6. Discussion & Conclusions and the role of ICTs

Based on the official definition of ADHD, it is the most common neurodevelopmental disorder of childhood where the person has deficits at 3 developmental levels. In particular, in areas of attention deficit, observation and hyperactivity.

Based on the research studied, there seems to be a great effect of thyroid hormone. Maternal hypothyroidism during pregnancy has been associated with symptoms of ADHD in offspring. Thyroid stimulating hormone (TSH) values increase the risk of developing ADHD and affect children's low cognitive function more. In addition, vitamin D seems to affect children with ADHD as levels are at low grades. ADHD is largely comorbidity with anxiety and based on this, evidence of immune indeterminacy has been found as a result of a neuroendocrine response to oxidative stress and other, such as, steroid hormones, enzymes or cytokines.

Neurotransmitters are, as mentioned above, the biochemical compounds that help the transition of information from one neuron to the next (Tzikopoulos, 2017) and are related to behavioral control, attention focus, etc. Research has shown that in people with ADHD dopamine and norepinephrine, which are associated with the regulation of attention, are at low levels, but also others such as dopamine, epinephrine, which are associated with stress. Parabens are generally considered as harmful to the human body and health. Where there was a concentration of parabens in children's organisms, there was a higher probability of diagnosing children, with ADHD. Also there are deficits of zinc and iron in children, the findings indicate a worsening of the symptomatology. There is a strong correlation between sugar and the products that include it, with ADHD. It also seems to intensify the symptomatology and cause difficulty in children's sleep.

As for the mother's lifestyle during pregnancy, research converges on the fact that the child will have symptoms of ADHD growing up. They also end up with the same result if mothers also experience concomitant disorders, such as depression or sleep

disorders. In addition, there seems to be a well-documented relationship between mother smoking during pregnancy and ADHD.

The anxiety of parental responsibility has a significant effect on the symptomatology of ADHD. The careless and over-active behaviors that characterize ADHD can have a negative impact on the parent-child relationship, resulting in an increase in parental anxiety. Also, strong feelings of social isolation from mothers and restriction of their parental role were observed. An important role in the development of stress is also played by the emotional intelligence of parents. In addition, research that was included, concerns the stress of caregivers in children with ADHD, there were increased levels of cortisol in their body.

It follows from the literature review that play therapy, yoga, meditation, physical exercise and neurofeedback can complement the basic therapeutic method they follow in order to improve their physical, emotional, social and behavioral state.

Finally, taking into account the pyramid of knowledge (8 levels: Foundations - Data - Knowledge - Specialization and Distinctions - Self-realization - Universal knowledge - Transcendence) as well as the influence of Emotional Intelligence, which is the driving force of emotion, thinking, knowledge, problem solving and decision-making, with the appropriate training and training of body and mind, become useful tools for the purpose of higher levels of their acquisition, as well as the better regulation of the mental function of the individual, through self-control and stress control. (Drigas and Pappas, 2017; Drigas and Mitsea, 2021; Drigas and Papoutsis, 2018; Drigas and Mitsea, 2020).

The incorporation of digital technologies in education domain is very productive and successful, facilitates and improves the educational procedures and in parallel improves stress levels of the students, via Mobiles [52-65], various ICTs applications [66-102], AI & STEM [103-114], and games [115-124] Additionally the combination of ICTs with theories and models of metacognition, mindfulness, meditation and emotional intelligence cultivation [125-177] as well as with environmental factors and nutrition [48-51], accelerates and improves more over the educational practices and the ability of stress control of the students and so that to increase their productivity.

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