

Πρόγραμμα Μεταπτυχιακών Σπουδών Εξειδίκευσης
Του Τμήματος Ελληνικής Φιλολογίας του Δημοκρίτειου Πανεπιστημίου Θράκης
σε συνεργασία με το
ΕΚΕΦΕ Δημόκριτος – Ινστιτούτο Πληροφορικής και Επικοινωνιών
με τίτλο: «Εξειδίκευση στις Τ.Π.Ε. και Ειδική Αγωγή – Ψυχοπαιδαγωγική της ένταξης»

ΔΙΑΤΡΟΦΗ ΚΑΙ ΔΕΠ-Υ
NUTRITION AND ADHD
της
Ματαλιωτάκη Καλλιόπης

Μεταπτυχιακή διατριβή που υποβάλλεται
στην τριμελή επιτροπή για την απόκτηση του μεταπτυχιακού τίτλου του
Προγράμματος Μεταπτυχιακών Σπουδών Εξειδίκευσης
του Τ.Ε.Φ. – Δ.Π.Θ. σε συνεργασία με το Ε.Κ.Ε.Φ.Ε. Δημόκριτος – Ινστιτούτο
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ένταξης»

Η τριμελής επιτροπή:

1. ΑΘΑΝΑΣΙΟΣ ΔΡΙΓΚΑΣ

ΕΡΕΥΝΗΤΗΣ Α' ΒΑΘΜΙΔΑΣ – Ε.Κ.Ε.Φ.Ε. «ΔΗΜΟΚΡΙΤΟΣ»

2. ΚΩΝΣΤΑΝΤΙΝΟΣ ΠΕΤΡΟΓΙΑΝΝΗΣ

ΚΑΘΗΓΗΤΗΣ – ΕΑΠ

3. ΣΥΡΙΟΠΟΥΛΟΥ ΧΡΙΣΤΙΝΑ

ΚΑΘΗΓΗΤΡΙΑ – ΠΑΝΕΠΙΣΤΗΜΙΟ ΜΑΚΕΔΟΝΙΑΣ

Κομοτηνή/Αθήνα

ΠΕΡΙΛΗΨΗ

Η Διαταραχή Ελλειμματικής Προσοχής και Υπερκινητικότητα είναι μία πολυπαραγοντική ψυχιατρική διαταραχή με νευροβιολογική βάση. Σύμφωνα με τις βιβλιογραφικές έρευνες οι περιβαλλοντικοί και οι διατροφικοί παράγοντες εντείνουν τις πιθανότητες εκδήλωσης ή/και την ένταση των συμπτωμάτων της. Σκοπός της παρούσας βιβλιογραφικής ανασκόπησης είναι να εκθέσει τους περιβαλλοντικούς και διατροφικούς παράγοντες κινδύνου, την επίδραση που έχουν στη συμπτωματολογία της ΔΕΠ-Υ και πώς μπορεί η διατροφή να συμβάλλει στη μείωση της έντασης αυτής της συμπτωματολογίας.

ABSTRACT

Attention Deficit Hyperactivity Disorder is a multifactorial psychiatric disorder with a neurobiological basis. According to the literature, environmental and nutritional factors increase the likelihood of its occurrence and / or the intensity of its symptoms. The purpose of this review is to expose environmental and nutritional risk factors, their impact on ADHD symptoms, and how diet can help reduce the severity of this symptomatology.

ΒΙΒΛΙΟΓΡΑΦΙΑ

Achenbach, T., (2002) *Εγχειρίδια για τα ερωτηματολόγια και προφίλ σχολικής ηλικίας ΣΑΕΒΑ (Σύστημα Achenbach εμπειρικά βασισμένη αξιολόγηση)*. Αθήνα: Ελληνικά Γράμματα

ACGIH. American conference of governmental industrial hygienists, 2007. Cadmium. Threshold limit values for chemical substances and physical agents and biological exposure indices. Cincinnati, OH: American Conference of Governmental Industrial Hygienists; 2007. p. 17.

Argos M, Kalra T, Rathouz PJ, Chen Y, Pierce B, Parvez F, et al. Arsenic exposure from drinking water, and all-cause and chronic-disease mortalities in Bangladesh (HEALS): a prospective cohort study. *Lancet* 2010;376:252–8.

Aschner M, Guilarte TR, Schneider JS, Zheng W. Manganese: recent advances in under-standing its transport and neurotoxicity. *Toxicol Appl Pharmacol* 2007;221:131–47.

Ackerman JP, Riggins T, Black MM (2010). A review of the effects of prenatal cocaine exposure among school-aged children. *Pediatrics*. 125(3):554–565.10.1542/peds.20090637 [PubMed: 20142293].

Azadbakht, L., Esmailzadeh, A., 2012. Dietary patterns and attention deficit hyperactivity disorder among Iranian children. *Nutrition* 28 (3), 242–249. <https://doi.org/10.1016/j.nut.2011.05.018>.

Ahn, J., Ahn, HS., Cheong, JH., Dela, Pena I. (2016) *Natural Product-Derived Treatments for Attention-Deficit/ Hyperactivity Disorder: Safety, Efficacy, and Therapeutic Potential of Combination Therapy*. *Neural Plasticity*. 1-18.

American Psychiatric Association, 2013. Diagnostic and Statistical Manual of Mental Disorders (DSM-5®). American Psychiatric Pub.

Arnold, LE. & DiSilvestro, RA. (2005) *Zinc in Attention-Deficit/Hyperactivity Disorder*. *Journal of child and adolescent psychopharmacology*. 15(4), 619-627

ATSDR. Agency for Toxic Substances and Disease Registry, 2007. Toxicological profile for arsenic. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services 2007.

ATSDR. Agency for Toxic Substances and Disease Registry, 2007. Toxicological profile for manganese. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services 2008.

ATSDR. Agency for Toxic Substances and Disease Registry, 2011. The priority list of hazardous substances, 2011. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services 2011.

Au WW. Susceptibility of children to environmental toxic substances. *Int J Hyg Environ Health* 2002;205:501–3.

Banaschewski, T., Neale, B.M., Rothenberger, A., & Roessner, V. (2007). Comorbidity of tic disorder and ADHD- conceptual and methodological considerations. *European Child and Adolescent Psychiatry*, 16(suppl 1), 15-i14.

Bao QS, Lu CY, Song H, Wang M, Ling W, Chen WQ, et al. Behavioural development of school-aged children who live around a multi-metalsulphide mine in Guangdong province, China: a cross-sectional study. *BMC Public Health* 2009;9:217.

Barkley, R. A. (1997) Behavioral inhibition, sustained attention, and executive functions: constructing a unifying theory of ADHD. *Psychol Bull* 121(1): 65-94.

Bellinger DC. Comparing the population neurodevelopmental burdens associated with children's exposures to environmental chemicals and other risk factors. *Neurotoxicology* 2012;33:641–3.

Bilbo, S.D., Tsang, V., 2010. *Enduring consequences of maternal obesity for brain inflammation and behavior of offspring*. *FASEB J.* 24, 2104–2115 PubMed: 20124437.

Blum, K., Chen, A.L.-C., Braverman, E.R., Comings, D.E., Chen, T.J., Arcuri, V., et al., 2008. *Attention-deficit-hyperactivity disorder and reward deficiency syndrome*. *Neuropsychiatr. Dis. Treat.* 4 (5), 893.

Bloch, MH., Mulqueen, J. (2014) *Nutritional Supplements for the Treatment of Attention-Deficit Hyperactivity Disorder*. *Child Adolesc Psychiatr Clin N Am.* 23(4), 883–897.

Bos, DJ., Oranje, B., Veerhoek, ES., et al. (2015) *Reduced Symptoms of Inattention after Dietary Omega-3 Fatty Acid Supplementation in Boys with and without Attention Deficit/Hyperactivity Disorder*. *Neuropsychopharmacology*. 40, 2298–2306.

Bouchard MF, Sauvé S, Barbeau B, Legrand M, Brodeur MÈ, Bouffard T, et al. Intellectual impairment in school-age children exposed to manganese from drinking water. *Environ Health Perspect* 2011;119:138–43.

Brinkmana, WB., Epstein, JN., Auinger, P., et al. (2015) *Association of AttentionDeficit/Hyperactivity Disorder and Conduct Disorder with Early Tobacco and Alcohol Use*. *Drug Alcohol Depend*. 0: 183–189

Burgio E., Ciaula. A. (2018). *Clinical Handbook of Air Pollution-Related Diseases*. 231252.

Cao Y, Chen A, Radcliffe J, Dietrich KN, Jones RL, Caldwell K, et al. Postnatal cadmium exposure, neurodevelopment, and blood pressure in children at 2, 5, and 7 years of age. *Environ Health Perspect* 2009;117:1580–6.

Counter SA, Buchanan LH. Mercury exposure in children: a review. *Toxicol Appl Pharmacol* 2004;198:209–30.

Clark, DB, Kirisci, L, Moss, HB. Early adolescent gateway drug use in sons of fathers with substance use disorders. *Addict Behav* 1998; 23: 561-566.

Cortese, S., Isnard, P., Frelut, ML., et al. (2007) Association between symptoms of attentiondeficit/ hyperactivity disorder and bulimic behaviors in a clinical sample of severely obese adolescents. *International Journal of Obesity*.31, 340-346.

Del-Ponte, B., Anselmi, L., Assunção, M. C. F., Tovo-Rodrigues, L., Munhoz, T. N., Matijasevich, A., ... & Santos, I. S. (2019). Sugar consumption and attention-deficit/hyperactivity disorder (ADHD): A birth cohort study. *Journal of affective disorders*, 243, 290-296.

DiNieri JA, Wang XY, Szutorisz H, Spano SM, Kaur J, Casaccia P, Hurd YL. Maternal Cannabis Use Alters Ventral Striatal Dopamine D2 Gene Regulation in the Offspring. *Biol Psychiatry*. 2011; 70(8):763–769.10.1016/J.Biopsych.2011.06.027 [PubMed: 21820648]

Docet, M., Larranaga, A., Méndez, L.P., Garcia-Mayor, R., 2012. Attention deficit hyperactivity disorder increases the risk of having abnormal eating behaviours in obese adults. *Eat. Weight Disord.: Stud. Anorexia Bulimia Obes.* 17 (2), e132–e136.

Dubnov-Raz, G., Khoury, Z., Wright, I., et al. (2014) *The effect of alpha-linolenic acid supplementation on ADHD symptoms in children: a randomized controlled double blind study.* *Frontiers in Human Neuroscience.* 8, 780.

Duckworth, A.I., Tsukayama, E. & Geier, A.B. (2010) *Self-controlled children stay leaner in the transition to adolescence.* *Appetite.* 54, 304-308

Elia, J., Laracy, S., Allen, J., Nissley-Tsiopinis, J., & BorgmannWinter, K. (2012). Epigenetics: Genetics versus life experiences. *Current Topics in Behavioral Neurosciences*, 9, 317-340. Doi: 10.1007/7854_2011_144.

El Marroun H, Tiemeier H, Steegers EAP, Jaddoe VWV, Hofman A, Verhulst FC, Huizink AC.(2009) Intrauterine Cannabis Exposure Affects Fetal Growth Trajectories: The Generation R Study. *Journal of the American Academy of Child and Adolescent Psychiatry.* 48(12):1173– 1181.10.1097/Chi.0b013e3181bfa8ee [PubMed: 19858757]

Ericson JE, Crinella FM, Clarke-Stewart KA, Allhusen VD, Chan T, Robertson RT. Prenatal manganese levels linked to childhood behavioural disinhibition. *Neurotoxicol Teratol* 2007;29:181–7.

Farias AC, Cunha A, Benko CR, McCracken JT, Costa MT, Farias LG, et al. Manganese in children with attention-deficit/hyperactivity disorder: relationship with methyl-phenidate exposure. *J Child Adolesc Psychopharmacol* 2010;20:113–8.

Fuster, J.M. M. Bodner, J. Kroger. (2001). Cross-modal and cross-temporal association in neurons of frontal cortex. *Nature*, pp. 347-351.

Gil F, Gisbert-Calabuig JA. Intoxicaciones por otros metales. Capítulo 70. In: Villanueva E, editor. *Gisbert-Calabuig Medicina Legal y Toxicología* 6ª ed. ; 2004. p. 964–80.

Gil F, Pla A. Biomarkers as biological indicators of xenobiotic exposure. *J Appl Toxicol* 2001;21:245–55 Review article.

Grandjean P, Landrigan PJ. Developmental neurotoxicity of industrial chemicals. *Lancet* 2006;368:2167–78 [Review].

Hall AH. Chronic arsenic poisoning. *Toxicol Lett* 2002;128:69–72. International Programme on Chemical Safety. Arsenic and arsenic compounds. Environmental health criteria, 224. Geneva: World Health Organization 2001.

Hackshaw A, Rodeck C, Boniface S. (2011) Maternal smoking in pregnancy and birth defects: a systematic review based on 173 687 malformed cases and 11.7 million controls. *Hum Reprod Update*. 17(5):589–604.10.1093/humupd/dmr022 [PubMed: 21747128]

Haahesly, AL, Wilens, TE, Biederman, J, Van Patten, SL, Spencer, T. Temporal association between childhood psychopathology and substance use disorders: Findings from a sample of adults with opioid or alcohol dependency. *Psychiatry Res* 2002; 109: 245-253.

Hawkey, E., Nigg, JT. (2014) *Omega—3 fatty acid and ADHD: Blood level analysis and metaanalytic extension of supplementation trials*. *Clin Psychol Rev*.34(6), 496–505.

Healy SM, Wildfang E, Zakharyan RA, Aposhian HV. Diversity of inorganic arsenite biotransformation. *Biol Trace Elem Res* 1999;68:249–66.

Heath C, Picciotto M. (2009) Nicotine-induced plasticity during development: modulation of the cholinergic system and long-term consequences for circuits involved in attention and sensory processing. *Neuropharmacology* 1):254–62. doi:10.1016/j.neuropharm.2008.07.020

Howard, A.L., Robinson, M., Smith, G.J., Ambrosini, G.L., Piek, J.P., Oddy, W.H., 2011. ADHD is associated with a “Western” dietary pattern in adolescents. *J. Atten. Disord*. 15 (5), 403–411.

Huizink AC. (2013) Prenatal cannabis exposure and infant outcomes: Overview of studies. *Prog Neuropsychopharmacol Biol Psychiatry*.

Jakubowski M. Low-level environmental lead exposure and intellectual impairment in children—the current concepts of risk assessment. *Int J Occup Med Environ Health* 2011;24:1–7.

Johnson, R.J., Gold, M.S., Johnson, D.R., Ishimoto, T., Lanaspa, M.A., Zahniser, N.R., et al., 2011. Attention-deficit/hyperactivity disorder: is it time to reappraise the role of sugar consumption. *Postgrad. Med.* 123 (5), 39–49.

Κάβουρα, Δ. Κ. (2018). *Μοριακή βάση της διαταραχής ελλειμματικής προσοχής-υπερκινητικότητας (Bachelor's thesis)*.

Κακουρός Ε., (2001), Το Υπερκινητικό Παιδί, *Εκδόσεις Ελληνικά Γράμματα*.

Karvela, M., Vergi, A. A., Βεργή, Α. Α., & Καρβέλα, Μ. (2019). Η διατροφική κατάσταση των παιδιών και των εφήβων με διαταραχή ελλειμματικής προσοχής-υπερκινητικότητας.

Khan K, Factor-Litvak P, Wasserman GA, Liu X, Ahmed E, Parvez F, et al. Manganese exposure from drinking water and children's classroom behavior in Bangladesh. *Environ Health Perspect* 2011;119:1501–6.

Kiddie, JY., Weiss, MD., Kitts, DD., et al. (2010) *Nutritional status of children with attention deficit hyperactivity disorder: a pilot study*. *Int J Pediatr*. 2010,1-7

Kim P, Park JH, Choi CS, Choi I, Joo SH, Kim MK, et al. (2013) Effects of ethanol exposure during early pregnancy in hyperactive, inattentive and impulsive behaviors and MeCP2 expression in rodent offspring. *Neurochem Res* 38(3):620–31. doi: 10.1007/s11064-012-0960-5

Kim, Y., Chang, H., 2011. Correlation between attention deficit hyperactivity disorder and sugar consumption, quality of diet, and dietary behavior in school children. *Nutr. Res. Pract.* 5 (3), 236–245.

Krüger K, Straub H, Hirner AV, Hippler J, Binding N, Musshoff U. Effects of monomethylarsonic and monomethylarsonous acid on evoked synaptic potentials in hippocampal slices of adult and young rats. *Toxicol Appl Pharmacol* 2009;236: 115–23.

Laake, D., Compart, P. (2013) *The ADHD and Autism Supplement Handbook- Kindle Edition*, Fair Winds Press.

Lange, K.W. Reichl, S., Lange, K.M, Tucha, L., & Tucha, O. (2010). The history of attention deficit hyperactivity disorder. *Attention Deficit and Hyperactivity Disorders*, 2, 241- 255.

Landrigan PJ, Kimmel CA, Correa A, Eskenazi B. Children's health and the environment: public health issues and challenges for risk assessment. *Environ Health Perspect* 2004;112:257–65.

Lehninger, A.L., 2002. *Lehninger Principios En Bioquímica*. Editorial Omega.

Lien, L., Lien, N., Heyerdahl, S., Thoresen, M., Bjertness, E., 2006. Consumption of soft drinks and hyperactivity, mental distress, and conduct problems among adolescents in Oslo, Norway. *Am. J. Public Health* 96 (10), 1815.

Linnet, KM., Dalsgaard, S., Obel, C., et al. (2003) *Maternal Lifestyle Factors in Pregnancy Risk of Attention Deficit Hyperactivity Disorder and Associated Behaviors: Review of the Current Evidence*. *Am J Psychiatry*. 60,1028-1040

Lenoir M., Serre F., Cantin L., Ahmed S.H.. Intense sweetness surpasses cocaine reward. 2007.

Leventakou, V., Micali, N., Georgiou, V., Sarri, K., Koutra, K., Koinaki, S., et al., 2016. Is there an association between eating behaviour and attention-deficit/hyperactivity disorder symptoms in preschool children. *J. Child Psychol. Psychiatry* 57 (6), 676–684.

Luo JH, Qiu ZQ, Shu WQ, Zhang YY, Zhang L, Chen JA. Effects of arsenic exposure from drinking water on spatial memory, ultra-structures and NMDAR gene expression of hippocampus in rats. *Toxicol Lett* 2009;184:121–5.

Ly, V., Bottelier, M., Hoekstra, PJ., et al. (2017) *Elimination diets' efficacy and mechanisms in attention deficit hyperactivity disorder and autism spectrum disorder*. *Eur Child Adolesc Psychiatry*. 1-17

Martin, ISM., Blumenfeld Olivares, JA., Garicano Vilar, E., et al. *Nutritional and environmental factors in attention- deficit hyperactivity disorder (ADHD): A cross-sectional study*. *Nutritional Neuroscience*. 1-7

Martinez- Badia, J., Martinez-Raga, J., (2015) *Who says this is a modern disorder? The early history of attention deficit hyperactivity disorder*. *World J Psychiatr*. 5 (4), 379-386.

Millichap, JG., Yee, MM., (2012) *The Diet Factor in Attention-Deficit/Hyperactivity Disorder*. *Pediatrics*.129-330.

M. Rodríguez-Barranco et al. / Science of the Total Environment 454–455 (2013) 562–577.

Mortazavi, G., Haghani, M., Rastegarian, N., Zarei, S., & Mortazavi, S. M. J. (2016). Increased release of mercury from dental amalgam fillings due to maternal exposure to electromagnetic fields as a possible mechanism for the high rates of autism in the offspring: introducing a hypothesis. *Journal of biomedical physics & engineering*, 6(1), 41.

Nigg JT, Holton K, Restriction and Elimination Diets in ADHD Treatment. *Child Adolesc Psychiatr Clin N Am* 2014 , 23(4): 937–953

Nikolas, M. A., & Nigg, J. T. (2015). Moderators of neuropsychological mechanism in attention-deficit/hyperactivity disorder. *Journal of Abnormal Child Psychology*, 43, 271– 281.

Olinto, M., Kac, G., Sichieri, R., Gigante, D., 2007. Padrões alimentares: análise de componentes principais. In: Kac, G., Sichieri, R., Gigante, D.P. (Eds.), Organizadores Epidemiologia Nutricional Rio de Janeiro. Editora Fiocruz/Editora Atheneu, pp. 213–225.

Orloff K, Mistry K, Metcalf S. Biomonitoring for environmental exposures to arsenic. *J Toxicol Environ Health B* 2009;12:509–24.

Pagani LS. (2014) Environmental tobacco smoke exposure and brain development: the case of attention deficit/hyperactivity disorder. *Neurosci Biobehav Rev* 44:195–205.

Park, S., Cho, S.-C., Hong, Y.-C., Oh, S.-Y., Kim, J.-W., Shin, M.-S., et al., 2012. Association between dietary behaviors and attention-deficit/hyperactivity disorder and learning disabilities in school-aged children. *Psychiatry Res.* 198 (3), 468–476.

Parvez F, Wasserman GA, Factor-Litvak P, Liu X, Slavkovich V, Siddique AB, et al. Arsenic exposure and motor function among children in Bangladesh. *Environ Health Perspect* 2011;119:1665–70.

Patrick, RP., Ames, BN. (2017) *Vitamin D and the omega-3 fatty acids control serotonin synthesis and action, part 2: relevance for ADHD, bipolar disorder, schizophrenia, and impulsive behavior*. The FASEB Journal. 29(6), 2207-2222

Patterson, P.H., 2011. Maternal infection and autism. *Brain Behav. Immunity* 26, 393

Peacock, P.J., Lewis, G., Northstone, K., Wiles, N.J., 2011. Childhood diet and behavioural problems: results from the ALSPAC cohort. *Eur. J. Clinical Nutr.* 65 (6), 720–726.

Pieper, JR., Laugero, KD. (2013) *Preschool children with lower executive function may be more vulnerable to emotional-based eating in the absence of hunger.* *Appetite.* 62, 103-109

Ptacek, R., Kuzelova, H., Stefano, GB., Raboch, J., et al. (2014) *Disruptive patterns of eating behaviours and associated lifestyles in males with ADHD.* *Medical Science Monitor.* 20, 608-613

Ptacek, R., Kuzelova, H., Stefano, G.B., Raboch, J., Sadkova, T., Goetz, M., et al., 2014. Disruptive patterns of eating behaviors and associated lifestyles in males with ADHD. *Med. Sci. Monit.* 20, 608.

Quesadaa, D.,Ahmed, NU., Fennie, KP., et al. (2018) *A Review: Associations Between Attentiondeficit/hyperactivity Disorder, Physical Activity, Medication Use, Eating Behaviors and Obesity in Children and Adolescents.* *Archives of Psychiatric Nursing.* 32,495– 504.

Ray, G.T., Croen, L.A., Habel, L.A., 2009. Mothers of children diagnosed with attentiondeficit/hyperactivity disorder: health conditions and medical care utilization in periods before and after birth of the child. *Med. Care* 47, 105–114 PubMed: 19106738.

Razlog, R., Pellow, J., White, SJ. (2012) *A pilot study on the efficacy of Valeriana Officinalis mother tincture and Valeriana officinalis 3X in the treatment of attention deficit hyperactivity disorder,* *Health SA Gesundheit.* 17 (1), 1-7.

Riccio C, Sullivan J, Cohen M. Neuropsychological assessment and intervention for childhood and adolescent disorders. Hoboken, New Jersey: John Wiley & Sons, Inc. 2010.

Rice D, Barone Jr S. Critical periods of vulnerability for the developing nervous system. Evi-dence from humans and animals models. *Environ Health Perspect* 2000;108(Suppl. 3): 511–33.

Rios- Hernandez, A., Alda, JA., Farran- Codina, A., et al. (2017) *The Mediterranean Diet and ADHD in Children and Adolescents.* *Pediatrics.* 139 (2)

Rodríguez-Barranco, M., Lacasaña, M., Aguilar-Garduño, C., Alguacil, J., Gil, F., González-Alzaga, B., & Rojas-García, A. (2013). Association of arsenic, cadmium and manganese exposure with neurodevelopment and behavioural disorders in children: a systematic review and meta-analysis. *Science of the total environment*, 454, 562-577.

Rosa, N.P., Lou, H., Cumming, P., Pryds, O., Gjedde, A., 2002. Methylphenidate-evoked potentiation of extracellular dopamine in the brain of adolescents with premature birth: correlation with attentional deficit. *Ann. N.Y.Acad. Sci.* 965, 434–439.

Rosado JL, Ronquillo D, Kordas K, Rojas O, Alatorre J, Lopez P, et al. Arsenic exposure and cognitive performance in Mexican schoolchildren. *Environ Health Perspect* 2007;115:1371–5.

Schoeman K, Bend JR, Hill J, Nash K, Koren G. Defining a lowest observable adverse effect hair concentrations of mercury for neurodevelopmental effects of prenatal methyl-mercury exposure through maternal fish consumption: a systematic review. *Ther Drug Monit* 2009;31:670–82.

Schmitz, M., Denardin, D., Silva, T. L., et al. (2006). Association between alpha-2adrenergic receptor gene and ADHD inattentive type. *Biol Psychiatry* 60(10): 1028-33.

Shagirtha K, Muthumani M, Prabu SM. Melatonin abrogates cadmium induced oxidative stress related neurotoxicity in rats. *Eur Rev Med Pharmacol Sci* 2011;15:1039–50.

Sharkey, L., Fitzgerald, M. (2007) *Handbook of Attention Deficit Disorder*. John Wiley & Sons Ltd. 1, 3-9

Schlotz, W., Jones, A., Phillips, D. I., Gale, C. R., Robinson, S. M., & Godfrey, K. M. (2010). Lower maternal folate status in early pregnancy is associated with childhood hyperactivity and peer problems in offspring. *Journal of Child Psychology and Psychiatry*, 51, 594-602.

Schwartz, M.W., Woods, S.C., Porte, D., Seeley, R.J., Baskin, D.G., 2000. Central nervous system control of food intake. *Nature* 404 (6778), 661–671.

Seitz, J, Kahraman-Lanzerath, B, Legenbauer, T, Sarrar, L, Herpertz, S, Salbach-Andrae, H, et al., 2013. The role of impulsivity, inattention and comorbid ADHD in patients with bulimia nervosa. PLoS One 8 (5) e63891.

Sinn, N. (2008) *Nutritional and dietary influences on attention deficit hyperactivity disorder*. Nutr Rev. 66 (10),558-68.

Sjowall, D., & Thorell, L. B. (2014). Functional impairments in attention deficit/hyperactivity disorder: The mediating role of neuropsychological functioning. *Developmental Neuropsychology*, 39, 187–204.

Smedley, Kinniburgh. A review of the source, behaviour and distribution of arsenic in natural waters. Appl Geochem 2002;17:517–68.

Sullivan, E.L., Nousen, L., Chamlou, K., 2014. Maternal high diet consumption during the perinatal period programs offspring behavior. Physiol. Behav. 123. <https://doi.org/10.1016/j.physbeh.2012.07.2014>.

Tian LL, Zhao YC, Wang XC, Gu JL, Sun ZJ, Zhang YL, et al. Effects of gestational cadmium exposure on pregnancy outcome and development in the offspring at age 4.5 years. Biol Trace Elem Res 2009;132:51–9.

Toplak, M. E., Jain, U., and Tannock, R. (2005) Executive and motivational processes in adolescents with Attention- Deficit- Hyperactivity Disorder (ADHD). *Behav Brain Funct* 1(1): 8

Tsai SY, Chou HY, The HW, Chen CM, Chen CJ. The effects of chronic arsenic exposure from drinking water on the neurobehavioral development in adolescence. Neurotoxicology 2003;24:747–53.

U.S. Geological Survey. Mineral commodity summaries 2011. U.S. Geological Survey 2011 [198 pp.].

Van Dongen-Boomsma, M., Vollebregt, M. A., Buitelaar, J. K., & Slaats-Willemse, D. (2014). Working memory training in young children with ADHD: A randomized placebocontrolled trial. *Journal of Child Psychology and Psychiatry*, 55, 886–896.

Volkow, N.D., Wang, G.-J., Newcorn, J., Fowler, J.S., Telang, F., Solanto, M.V., et al., 2007. Brain dopamine transporter levels in treatment and drug naive adults with ADHD. Neuroimage 34 (3), 1182–1190.

Volkow, N.D., Wang, G.-J., Newcorn, J.H., Kollins, S.H., Wigal, T.L., Telang, F., et al., 2011. Motivation deficit in ADHD is associated with dysfunction of the dopamine reward pathway. *Mol. Psychiatry* 16 (11), 1147–1154.

von Ehrenstein OS, Poddar S, Yuan Y, Mazumder DG, Eskenazi B, Basu A, et al. Children's intellectual function in relation to arsenic exposure. *Epidemiology* 2007;18:44–51.

Vucetic, Z., Totoki, K., Schoch, H., Whitaker, K. W., Hill-Smith, T., Lucki, I., & Reyes, T. M. (2010). *Early life protein restriction alters dopamine circuitry. Neuroscience*, 168, 359-370.

Wasserman GA, Liu X, Parvez F, Factor-Litvak P, Ahsan H, Levy D, et al. Arsenic and manganese exposure and children's intellectual function. *Neurotoxicology* 2011;32: 450–7.

Welsh, J.A., Sharma, A.J., Grellinger, L., Vos, M.B., 2011. Consumption of added sugars is decreasing in the United States. *Am. J. Clin. Nutr.* 94 (3), 726–734.

WHO, 2015. Guideline: Sugars Intake For Adults and Children. World Health Organization, Geneva.

WHO, World Health Organization. Manganese. Environmental health criteria, 17 1981[Geneva, Switzerland:(<http://www.inchem.org/documents/ehc/ehc/ehc017.htm>) Accessed 24 February 2012].

WHO, World Health Organization. Guidelines for drinking-water quality 3rd ed. 2004 [Geneva, Switzerland: (http://www.who.int/water_sanitation_health/dwq/gdwq3/en/)]. Accessed 21 February 2012].

46. Wilens, TE, Biederman, J, Kiely, K, Bredin, E, Spencer, TJ. Pilot Study of Behavioral and Emotional Disturbances in the High-risk children of parents with opioid dependence. *J Am Acad Child Adolesc Psychiatry* 1995; 34: 779-785.

Wise, R.A., 2006. Role of brain dopamine in food reward and reinforcement. *Philos. Trans. R. Soc. B: Biol. Sci.* 361 (1471), 1149–1158. Wolraich, M.L., Wilson, D.B., White, J.W., 1995. The effect of sugar on behavior or cognition in children: a meta-analysis. *JAMA* 274 (20), 1617–1621.

World Health Organization. (1993) *The ICD-10 Classification of Mental and Behavioural Disorders, Diagnostic criteria for research*. Geneva.

Wu, X., Ohinmaa, A., Veugelers, PJ. (2016) *The Influence of Health Behaviors in Childhood on Attention Deficit and Hyperactivity Disorder in Adolescence*. *Nutrients*, 8(12)

ΙΣΤΟΣΕΛΙΔΕΣ

<https://www.clickatlife.gr/your-life/story/106846> (προσπελάστηκε 01/06/2019)

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4795328/>

(προσπελάστηκε 10/06/2019)

<https://docplayer.gr/10433101-Diatarahi-elleimmatikis-prosohis-yperkinitikotitas-i-yperkinitiki-diatarahi.html> (προσπελάστηκε 15/06/2019)

<http://www.proseggisi.gr/κατανοωντας-τη-νευροβιολογικη-βαση-τ-2/>

(προσπελάστηκε 22/07/2019)

<http://www.scientific-journal-articles.org/greek/free-online-journals/medical/medical-articles/saxinidis-pb/pb.htm>

<http://blogs.sch.gr/sachinidi/files/2011/03/Naousa-2011.pdf>