

**‘Specialization in ICTs and Special Education: Psychopedagogy
of Integration’ Postgraduate Program**

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Philology in collaboration with
NCSR DEMOKRITOS Informatics and Telecommunications
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**INTERVENTION STRATEGIES FOR ATTENTION DEFICIT
(HYPERACTIVITY) DISORDER WITH THE CONTRIBUTION OF
METACOGNITION AND ICTS**

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ABSTRACT

Education in the 21st century is facing major challenges as well as unique opportunities. Attention Deficit Hyperactivity Disorder belongs to them, as it affects a significant percentage of students. At the same time, the advancements in information technology and neuroscience provide valuable knowledge and tools about the ways human can consciously regulate and upgrade his/her cognitive functions compensating for weaknesses with new abilities. In the present thesis, we seek out, through a literature review, new intervention strategies for ADHD with the contribution of metacognition and ICTs. The strategies aim at upgrading the structures, the mechanisms and the functions related to the symptomatology of ADHD. The intervention strategies include information and communication technologies, exercises, techniques and other practices that have been proven to upgrade intelligence, awaken the student and make him/her a conscious regulator of his/her own psycho-physiological functions. The common denominator of all the proposed strategies is the development of metacognition and consciousness. The recommended strategies can be used in the school context after a proper planning, while they can be implemented in addition to existing intervention programs.

Key-words: ICTs, metacognition, consciousness, executive functions, brain rewiring, exercises, techniques, strategies

References

- Alkiyumi, M. T. (2014). Impact of Analogical Images on Solving Scientific and Environmental Problems Creatively. *Psychology Research*, 4(5). doi:10.17265/2159-5542/2014.05.009
- Alves, C. R., Tessaro, V. H., Teixeira, L. A., Murakava, K., Roschel, H., Gualano, B., & Takito, M. Y. (2014). Influence of acute high-intensity aerobic interval exercise bout on selective attention and short-term memory tasks. *Perceptual and motor skills*, 118(1), 63-72. doi: 10.2466/22.06.PMS.118k10w4
- Amores, J., Benavides, X., & Maes, P. (2016, May). Psychicvr: Increasing mindfulness by using virtual reality and brain computer interfaces. In Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems(pp. 2-2). doi.org/10.1145/2851581.2889442
- Anagnostopoulou, P., Drigas, A. (2020) ICTs, Mindfulness and Emotional Intelligence in Inter-National Educational Policies, In International Journal of Recent Contributions from Engineering Science & IT (iJES), volume 8, 48–60. Doi.org 10.399/ijes.v8i4.18543
- Arnsten A. F. (2009). Toward a new understanding of attention-deficit hyperactivity disorder pathophysiology: an important role for prefrontal cortex dysfunction. *CNS drugs*, 23 Suppl 1, 33–41. <https://doi.org/10.2165/00023210-200923000-00005>
- Arsalidou, M., Duerden, E. G., & Taylor, M. J. (2013). The centre of the brain: topographical model of motor, cognitive, affective, and somatosensory functions of the basal ganglia. *Human brain mapping*, 34(11), 3031-3054. doi: 10.1002/hbm.22124

Arzi, A., Shedlesky, L., Ben-Shaul, M., Nasser, K., Oksenberg, A., Hairston, I. S., & Sobel, N. (2012). Humans can learn new information during sleep. *Nature neuroscience*, 15(10), 1460-1465. doi.org/10.1038/nn.3193

Asati, M., & Miyachi, T. (2019). A Short Virtual Reality Mindfulness Meditation Training For Regaining Sustained Attention. arXiv preprint arXiv:1907.04487.

Bakken, J. P. (2017). Mnemonic strategies: Helping students with intellectual and developmental disabilities remember important information. *Global Journal of Intellectual & Developmental Disabilities*, 2(2), 1-4. Doi.org: 10.19080/GJIDD.2017.02.555587

Bakola, L. N., Rizos, N. D., & Drigas, A. S. (2019). ICTs for Emotional and Social Skills Development for Children with ADHD and ASD Co-existence. *International Journal of Emerging Technologies in Learning*, 14(5).doi.org/103991/ijet.v14i05.9430

Banks, S. J., Eddy, K. T., Angstadt, M., Nathan, P. J., & Phan, K. L. (2007). Amygdala-frontal connectivity during emotion regulation. *Social cognitive and affective neuroscience*, 2(4), 303-312. doi.org/10.1093/scan/nsm029

Barrett, K. C., Ashley, R., Strait, D. L., & Kraus, N. (2013). Art and science: how musical training shapes the brain. *Frontiers in Psychology*, 4, 713. doi.org/10.3389/fpsyg.2013.00713

Barry, R. J., Clarke, A. R., & Johnstone, S. J. (2003). A review of electrophysiology in attention-deficit/hyperactivity disorder: I. Qualitative and quantitative

electroencephalography. Clinical neurophysiology, 114(2), 171-183.
doi.org/10.1016/S1388-2457(02)00362-0

Basso, J. C., & Suzuki, W. A. (2017). The effects of acute exercise on mood, cognition, neurophysiology, and neurochemical pathways: a review. *Brain Plasticity*, 2(2), 127-152. doi: 10.3233/BPL-160040

Beane, M., & Marrocco, R. T. (2004). Norepinephrine and acetylcholine mediation of the components of reflexive attention: implications for attention deficit disorders. *Progress in neurobiology*, 74(3), 167-181.
doi.org/10.1016/j.pneurobio.2004.09.001

Blume, F., Hudak, J., Dresler, T., Ehliis, A. C., Kühnhausen, J., Renner, T. J., & Gawrilow, C. (2017). NIRS-based neurofeedback training in a virtual reality classroom for children with attention-deficit/hyperactivity disorder: study protocol for a randomized controlled trial. *Trials*, 18(1), 1-16 doi: 10.1186/s13063-016-1769-3

Bronczek, G. A., Soares, G. M., de Barros, J. F., Vettorazzi, J. F., Kurauti, M. A., Marconato-Júnior, E., & Costa-Júnior, J. M. (2021). Resistance exercise training improves glucose homeostasis by enhancing insulin secretion in C57BL/6 mice. *Scientific reports*, 11(1), 1-11. doi.org/10.1038/s41598-021-88105-x

Brooks, W. (2003). Speed-Reading Techniques (Teaching and curriculum issues). *Journal of College of World Englishes*, 3, 33-47.

Buchanan, T. W. (2007). Retrieval of emotional memories. *Psychological bulletin*, 133(5), 761. doi.org/10.1037/0033-2909.133.5.761

Buchele Harris, H., Cortina, K. S., Templin, T., Colabianchi, N., & Chen, W. (2018). Impact of coordinated-bilateral physical activities on attention and concentration in school-aged children. BioMed research international. doi.org/10.1155/2018/2539748

Burk, J. A., Blumenthal, S. A., & Maness, E. B. (2018). Neuropharmacology of attention. European journal of pharmacology, 835, 162-168. doi.org/10.1016/j.ejphar.2018.08.008

Bush, G. (2010). Attention-deficit/hyperactivity disorder and attention networks. Neuropsychopharmacology, 35(1), 278-300. doi.org/10.1038/npp.2009.120

Chaddock. Heyman, L., Hillman, C. H., Cohen, N. J., & Kramer, A. F. (2014). III. The importance of physical activity and aerobic fitness for cognitive control and memory in children. Monographs of the Society for Research in Child Development, 79(4), 25-50. doi: 10.1111/mono.12129.

Chang, S. H. (2015). Memory Strategies Used by Teachers. Ohio Journal of Teacher Education, 29 (1), 5-19

Choi, E., Shin, S. H., Ryu, J. K., Jung, K. I., Kim, S. Y., & Park, M. H. (2020). Commercial video games and cognitive functions: video game genres and modulating factors of cognitive enhancement. *Behavioral and Brain Functions*, 16(1), 2. doi.org/10.1016/j.cobeha.2015.04.012

Choo, A., & May, A. (2014, October). Virtual mindfulness meditation: Virtual reality and electroencephalography for health gamification. In 2014 IEEE Games Media Entertainment (pp. 1-3). IEEE. doi: 10.1109/GEM.2014.7048076.

Chou, C. C., & Huang, C. J. (2017). Effects of an 8-week yoga program on sustained attention and discrimination function in children with attention deficit hyperactivity disorder. *PeerJ*, 5, e2883. <https://doi.org/10.7717/peerj.2883>

Cikajlo, I., Cizman Staba, U., Vrhovac, S., Larkin, F., & Roddy, M. (2017). A Cloud-Based Virtual Reality App for a Novel Telemindfulness Service: Rationale, Design and Feasibility Evaluation. *JMIR research protocols*, 6(6), e108. <https://doi.org/10.2196/resprot.6849>

Climie, E. A., & Mastoras, S. M. (2015). ADHD in schools: Adopting a strengths-based perspective. *Canadian Psychology/psychologie canadienne*, 56(3), 295. doi.org/10.1037/cap0000030

Conderman, G. (2019). Mnemonics for the middle grades. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 92(3), 71-77. doi.org/10.1080/00098655.2019.1579695

Craik, F. I., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of verbal learning and verbal behavior*, 11(6), 671-684. doi.org/10.1016/S0022-5371(72)80001-X

Dauden Roquet, C., & Sas, C. (2019, May). Digital wellbeing: Evaluating mandala coloring apps. In *2019 CHI Conference on Human Factors in Computing Systems*.

Desan, P. H., Setton, M. K., Holzer, A. A., Young, K. C., Sun, Y., He, F., ... & Yu, X. (2021). Attitude change after a curriculum on the science and philosophy of well-being and happiness for high school students: A classroom-randomized trial. *British Journal of Educational Psychology*, e12419. doi.org/10.1111/bjep.12419

Dhaniwala, N. K. S., Dasari, V., & Dhaniwala, M. N. (2020). Pranayama and Breathing Exercises-Types and Its Role in Disease Prevention & Rehabilitation. *Journal of Evolution of Medical and Dental Sciences*, 9(44), 3325-3331.

Di Lieto, M. C., Inguaggiato, E., Castro, E., Cecchi, F., Cioni, G., Dell'Ombo, M., ... & Dario, P. (2017). Educational Robotics intervention on Executive Functions in preschool children: A pilot study. *Computers in human behavior*, 71, 16-23. doi.org/10.1016/j.chb.2017.01.018

Diamond, A. (2000). Close interrelation of motor development and cognitive development and of the cerebellum and prefrontal cortex. *Child development*, 71(1), 44-56. doi.org/10.1111/1467-8624.00117

Dresler, M., Sandberg, A., Ohla, K., Bublitz, C., Trenado, C., Mroczko-Wąsowicz, A., & Repantis, D. (2013). Non-pharmacological cognitive enhancement. *Neuropharmacology*, 64, 529-543. doi.org/10.1016/j.neuropharm.2012.07.002

Drigas, A., & Mitsea, E. (2021) Metacognition, Stress–Relaxation Balance & Related Hormones. *International Journal of Recent Contributions from Engineering, Science & IT (iJES)*.doi.org/103991 ijesv9il.19623

Drigas A. , & Mitsea E. (2020c). A metacognition based 8 pillars mindfulness model and training strategies. *International Journal of Recent Contributions from Engineering, Science & IT (iJES)*. doi.org/103991/ijes.v8i4.17419

Drigas, A., & Mitsea, E. (2020b). The 8 Pillars of Metacognition. *International Journal of Emerging Technologies in Learning (iJET)*, 15(21), 162-178.doi.org/10399/ijet v15i2114907

Drigas, A., & Mitsea, E. (2020). The Triangle of Spiritual Intelligence, Metacognition and Consciousness. Int. J. Recent Contributions Eng. Sci. IT, 8(1), 4-23. doi.org/10.3991/ijes.v8i1.12503

Drigas, A. S., & Papoutsi, C. (2018). A new layered model on emotional intelligence. Behavioral Sciences, 8(5), 45. doi.org/10.3390/bs8050045

Drigas, A. S., & Pappas, M. A. (2017). The consciousness-intelligence-knowledge pyramid: an 8x8 layer model. International Journal of Recent Contributions from Engineering, Science & IT (IIES), 5(3), 14-25.doi.org / 103991 /ijes. v5i3.7680

Drigas, A. S., & Papoutsi, C. (2015). ICTs for assessment and intervention on cultivation of empathy. International Journal of Emerging Technologies in Learning, 10(5).doi.org/103991/ijet.v10i5.4731

Drigas, A., & Tourimpampa, A. (2014). Processes and ICT Tools for ADHD Assessment, Intervention and Attention Training. International Journal of Emerging Technologies in Learning, 9(6). doi.org / 103991 /ijet. V9i6.4001

Drigas, A. S., & Ioannidou, R. E. (2013). Special Education and ICTs. International Journal of Emerging Technologies in Learning, 8(2). Doi.org/103991/Ijet.v8i2.2514

Drigas, A. S., Argyri, K., & Vrettaros, J. (2009). Decade review (1999-2009): progress of application of artificial intelligence tools in student diagnosis. International Journal of Social and Humanistic Computing, 1(2), 175-191.

Drigas, A. S., Koukianakis, L. G., & Papagerasimou, Y. V. (2005). A system for e-inclusion for individuals with sight disabilities. Wseas transactions on circuits and systems, 4(11), 1776-1780.

Duffy, F. H., Shankardass, A., McAnulty, G. B., & Als, H. (2017). A unique pattern of cortical connectivity characterizes patients with attention deficit disorders: a large electroencephalographic coherence study. *BMC medicine*, 15(1), 1-19.

Dulčić, F. J. L. (2021). The practice of silence as an educational tool: guidelines for competence-based education. *Educação e Pesquisa*, 47. doi.org/10.1590/s1678-4634202147224651.

Ek, U., Westerlund, J., Holmberg, K., & Fernell, E. (2011). Academic performance of adolescents with ADHD and other behavioural and learning problems—a population-based longitudinal study. *Acta Paediatrica*, 100(3), 402-406. doi.org/10.1111/j.1651-2227.2010.02048.x

Erickson, K. I., Voss, M. W., Prakash, R. S., Basak, C., Szabo, A., Chaddock, L., ... & Kramer, A. F. (2011). Exercise training increases size of hippocampus and improves memory. *Proceedings of the National Academy of Sciences*, 108(7), 3017-3022. doi.org/10.1073/pnas.1015950108

Eriksson, J., Kalpouzos, G., & Nyberg, L. (2011). Rewiring the brain with repeated retrieval: a parametric fMRI study of the testing effect. *Neuroscience letters*, 505(1), 36–40. https://doi.org/10.1016/j.neulet.2011.08.061

Fehmi, L. G., & Shor, S. B. (2013). Open focus attention training. *The Psychiatric clinics of North America*, 36(1), 153-162.10.1016/j.psc.2013.01.003.

Gard, T., Taquet, M., Dixit, R., Hölzel, B. K., Dickerson, B. C., & Lazar, S. W. (2015). Greater widespread functional connectivity of the caudate in older adults who practice kripalu yoga and vipassana meditation than in controls. *Frontiers in human neuroscience*, 9, 137. doi.org/10.3389/fnhum.2015.00137

Garg, R., Malhotra, V., Tripathi, Y., & Agarawal, R. (2016). Effect of left, right and alternate nostril breathing on verbal and spatial memory. *Journal of clinical and diagnostic research: JCDR*, 10(2), CC01. 10.7860/JCDR/2016/12361.7197

Ghiya, S. (2017). Alternate nostril breathing: a systematic review of clinical trials. *Int J Res Med Sci*, 5(8), 3273-86. doi:10.18203/2320-6012.ijrms20173523

Gruszka, A., & Nęcka, E. (2017). Limitations of working memory capacity: The cognitive and social consequences. *European Management Journal*, 35(6), 776-784. doi.org/10.1016/j.emj.2017.07.001

Gupta, A., Pribesh, S., & Diawara, N. (2017). Therapeutic Breathing Techniques and Disparity Across Student Performance in English and Mathematics. *International Journal of Education & Multidisciplinary Studies*, 8(2). doi:10.21013/jems.v8.n2.p2

Hadjibalassi, M., Lambrinou, E., Papastavrou, E., & Papathanassoglou, E. (2018). The effect of guided imagery on physiological and psychological outcomes of adult ICU patients: a systematic literature review and methodological implications. *Australian Critical Care*, 31(2), 73-86. doi: 10.1016/j.aucc.2017.03.001.

Hoogman, M., Bralten, J., Hibar, D. P., Mennes, M., Zwiers, M. P., Schweren, L. S., & Franke, B. (2017). Subcortical brain volume differences in participants with attention deficit hyperactivity disorder in children and adults: a cross-sectional mega-analysis. *The Lancet Psychiatry*, 4(4), 310-319. doi.org/10.1016/S2215-0366(17)30049-4

Hosenbocus, S., & Chahal, R. (2012). A review of executive function deficits and pharmacological management in children and adolescents. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, 21(3), 223.

Imeraj, L., Antrop, I., Roeyers, H., Swanson, J., Deschepper, E., Bal, S., & Deboutte, D. (2012). Time-of-day effects in arousal: disrupted diurnal cortisol profiles in children with ADHD. *Journal of Child Psychology and Psychiatry*, 53(7), 782-789. doi.org/10.1111/j.1469-7610.2012.02526.x

Kapsi, S., Katsantoni, S., & Drigas, A. (2020). The Role of Sleep and Impact on Brain and Learning. *International Journal of Recent Contributions from Engineering, Science & IT (iJES)*, 8(3), pp 59-68. doi.org/ 103991/ijesv8i3.17099

Kinabalu, K. (2005). Immediate effect of 'nadi-shodhana pranayama' on some selected parameters of cardiovascular, pulmonary, and higher functions of brain. *Thai journal of physiological sciences*, 18(2), 10-16.

Kosunen, I., Salminen, M., Järvelä, S., Ruonala, A., Ravaja, N., & Jacucci, G. (2016). RelaWorld: neuroadaptive and immersive virtual reality meditation system. In Proceedings of the 21st International Conference on Intelligent User Interfaces(pp. 208-217). 10.1145/2856767.2856796

Krain, A. L., & Castellanos, F. X. (2006). Brain development and ADHD. *Clinical psychology review*, 26(4), 433-444. doi.org/10.1016/j.cpr.2006.01.005

Kraus, S. D. (2020). The Multiple Uses of Guided Imagery. *The Nursing clinics of North America*, 55(4), 467–474. doi.org/10.1016/j.cnur.2020.06.013

La Paglia, F., Rizzo, R., & La Barbera, D. (2011). Use of robotics kits for the enhancement of metacognitive skills of mathematics: a possible approach. *Studies in health technology and informatics*, 167, 26–30.

Lenartowicz, A., & Loo, S. K. (2014). Use of EEG to diagnose ADHD. *Current psychiatry reports*, 16(11), 498. doi: 10.1007/s11920-014-0498-0

LeRoy, A., Jacova, C., & Young, C. (2019). Neuropsychological performance patterns of adult ADHD subtypes. *Journal of attention disorders*, 23(10), 1136-1147. doi:10.1177/1087054718773927

Lim, C. G., Poh, X. W. W., Fung, S. S. D., Guan, C., Bautista, D., Cheung, Y. B., ... & Lee, T. S. (2019). A randomized controlled trial of a brain-computer interface based attention training program for ADHD. *PloS one*, 14(5), e0216225. doi.org/10.1371/journal.pone.0216225

Liu, D. Y., Shen, X. M., Yuan, F. F., Guo, O. Y., Zhong, Y., Chen, J. G., Zhu, L. Q., & Wu, J. (2015). The Physiology of BDNF and Its Relationship with ADHD. *Molecular neurobiology*, 52(3), 1467–1476. doi.org/10.1007/s12035-014-8956-6

Luders, E., Phillips, O. R., Clark, K., Kurth, F., Toga, A. W., & Narr, K. L. (2012). Bridging the hemispheres in meditation: thicker callosal regions and enhanced fractional anisotropy (FA) in long-term practitioners. *Neuroimage*, 61(1), 181-187. doi.org: 10.1016/j.neuroimage.2012.02.026

Lutz, A., Slagter, H. A., Dunne, J. D., & Davidson, R. J. (2008). Attention regulation and monitoring in meditation. *Trends in cognitive sciences*, 12(4), 163–169. <https://doi.org/10.1016/j.tics.2008.01.005>

Ma, X., Yue, Z. Q., Gong, Z. Q., Zhang, H., Duan, N. Y., Shi, Y. T., Wei, G. X., & Li, Y. F. (2017). The Effect of Diaphragmatic Breathing on Attention, Negative Affect and Stress in Healthy Adults. *Frontiers in psychology*, 8, 874. doi.org/10.3389/fpsyg.2017.00874

Melnichuk, M. C., Dockree, P. M., O'Connell, R. G., Murphy, P. R., Balsters, J. H., & Robertson, I. H. (2018). Coupling of respiration and attention via the locus coeruleus: Effects of meditation and pranayama. *Psychophysiology*, 55(9) doi.org/10.1111/psyp.13091

Mitsea, E., Drigas, A., & Mantas, P. (2021). Soft Skills & Metacognition as Inclusion Amplifiers in the 21 st Century. *International Journal of Online & Biomedical Engineering*, 17(4).doi.org/10399/ijoe.v17i04.20567

Mitsea, E., Lytra, N., Akrivopoulou, A., & Drigas, A. (2020). Metacognition, Mindfulness and Robots for Autism Inclusion. *International Journal of Advanced Corporate Learning (iJAC)*, 8(2), 4-20.doi.org/103991/ijesv8i2.14213

Mitsea, E., & Drigas, A. (2019). A Journey into the Metacognitive Learning Strategies. *International Journal of Online & Biomedical Engineering*, 15(14). doi.org/103991/ijoe.v15i14.11379

Moradi, J., Jalali, S., & Bucci, M. P. (2020). Effects of Balance Training on Postural Control of Children with Attention Deficit/Hyperactivity Disorder. *Iranian Journal of Pediatrics*,30(4). doi : 10.5812/ijp.95542

Mueller, A., Hong, D. S., Shepard, S., & Moore, T. (2017). Linking ADHD to the neural circuitry of attention. *Trends in cognitive sciences*, 21(6), 474-488. doi.org/10.1016/j.tics.2017.03.009

Nair, S., Sagar, M., Sollers III, J., Consedine, N., & Broadbent, E. (2015). Do slumped and upright postures affect stress responses? A randomized trial. *Health Psychology*, 34(6), 632. doi.org/10.1037/he0000146

Nelis, S., Vanbrabant, K., Holmes, E. A., & Raes, F. (2012). Greater positive affect change after mental imagery than verbal thinking in a student sample. *Journal of experimental psychopathology*, 3(2), 178-188.doi./10.5127/jep.021111

Nemeth, D., Janacsek, K., Polner, B., & Kovacs, Z. A. (2013). Boosting human learning by hypnosis. *Cerebral cortex*, 23(4), 801-805. doi:10.1093/cercor/bhu139

Núñez-Jaramillo, L., Herrera-Solís, A., & Herrera-Morales, W. V. (2021). ADHD: Reviewing the Causes and Evaluating Solutions. *Journal of Personalized Medicine*, 11(3), 166. doi.org/10.3390/jpm11030166

Oakley, D. A., & Halligan, P. W. (2009). Hypnotic suggestion and cognitive neuroscience. *Trends in cognitive sciences*,13(6), 264-270.doi: 10.1016/j.tics.2009.03.004.

Ou, Y. K., Wang, Y. L., Chang, H. C., Yen, S. Y., Zheng, Y. H., & Lee, B. O. (2020). Development of virtual reality rehabilitation games for children with attention-deficit hyperactivity disorder. *Journal of Ambient Intelligence and Humanized Computing*, 11(11), 5713-5720. doi.org/10.1007/s12652-020-01945-9

Paller, Ken; Oudiette, Delphine (2018). "Sleep learning gets real". *Scientific American*. 319 (5): 26–31. doi:10.1038/scientificamerican1118-26

Paller, K. A. (2017). Sleeping in a brave new world: Opportunities for improving learning and clinical outcomes through targeted memory reactivation. *Current directions in psychological science*, 26(6), doi:532-537.10.1177/0963721417716928

Papanastasiou, G., Drigas, A., Skianis, C., & Lytras, M. (2020). Brain computer interface based applications for training and rehabilitation of students with neurodevelopmental disorders. *A literature review*. *Heliyon*, 6(9), e04250.

Papanastasiou, G., Drigas, A., Skianis, C., & Lytras, M. D. (2017). Serious games in K-12 education: Benefits and impacts on students with attention, memory and developmental disabilities. *Program*. doi.org/10.1108/PROG-02-2016-0020

Păsărelu, C. R., Andersson, G., & Dobrean, A. (2020). Attention-deficit/hyperactivity disorder mobile apps: A systematic review. *International journal of medical informatics*, 138, 104133. doi.org/10.1016/j.ijmedinf.2020.104133

Pearson, J. (2019). The human imagination: the cognitive neuroscience of visual mental imagery. *Nature Reviews Neuroscience*, 20(10), 624-634.: 10.1038/s41583-019-0202-9

Poissant, H., Mendrek, A., Talbot, N., Khoury, B., & Nolan, J. (2019). Behavioral and cognitive impacts of mindfulness-based interventions on adults with attention-deficit hyperactivity disorder: a systematic review. *Behavioural neurology*, 2019. doi.org/10.1155/2019/5682050

Predoiu, R., Predoiu, A., Mitrache, G., Firantescu, M., Cosma, G., Dinuta, G., Bucuroiu, R. A. (2020) Visualisation techniques in sport – the mental road map for success. *Physical Education, Sport and Kinetotherapy Journal*, Volume 59, Issue 3, 245-256. doi:10/35189/dpeskj. 2050.59.3.4.

Rajabi, S., Pakize, A., & Moradi, N. (2020). Effect of combined neurofeedback and game-based cognitive training on the treatment of ADHD: A randomized controlled study. *Applied Neuropsychology: Child*, 9(3), 193-205.

Rayner, K., Schotter, E. R., Masson, M. E., Potter, M. C., & Treiman, R. (2016). So much to read, so little time: How do we read, and can speed reading help?. *Psychological Science in the Public Interest*, 17(1), 4-34. doi.org/10.1177/1529100615623267

Roebers, C. M. (2017). Executive function and metacognition: Towards a unifying framework of cognitive self-regulation. *Developmental Review*, 45, 31-51. doi.org/10.1016/j.dr.2017.04.001

Salimpoor, V. N., Benovoy, M., Larcher, K., Dagher, A., & Zatorre, R. J. (2011). Anatomically distinct dopamine release during anticipation and experience of peak emotion to music. *Nature neuroscience*, 14(2), 257. doi.org/10.1038/nn.2726

Savage, B. M., Lujan, H. L., Thipparthi, R. R., & DiCarlo, S. E. (2017). Humor, laughter, learning, and health! A brief review. *Advances in physiology education*. doi.org/10.1152/advan.00030.2017

Scharfman, H. E. (2016). The enigmatic mossy cell of the dentate gyrus. *Nature Reviews Neuroscience*, 17(9), 562. /doi.org/10.1038/nrn.2016.87

Schechtman, E., Witkowski, S., Lampe, A., Wilson, B. J., & Paller, K. A. (2020). Targeted memory reactivation during sleep boosts intentional forgetting of spatial locations. *Scientific reports*, 10(1), 1-9. doi: 10.1038/s41598-020-59019-x

Schlaug, G., Jäncke, L., Huang, Y., Staiger, J. F., & Steinmetz, H. (1995). Increased corpus callosum size in musicians. *Neuropsychologia*, 33(8), 1047–1055. doi.org/10.1016/0028-3932(95)00045-5

Schmalzl, L., Powers, C., & Henje Blom, E. (2015). Neurophysiological and neurocognitive mechanisms underlying the effects of yoga-based practices: towards a

comprehensive theoretical framework. *Frontiers in human neuroscience*, 9, 235. doi.org/10.3389/fnhum.2015.00235

Schreiner, T., & Rasch, B. (2015). Boosting vocabulary learning by verbal cueing during sleep. *Cerebral Cortex*, 25(11), 4169-4179. doi: 10.1093/cercor/bhu139

Schuck S, Emmerson N, Ziv H, Collins P, Arastoo S, Warschauer M, et al. (2016) Designing an iPad App to Monitor and Improve Classroom Behavior for Children with ADHD: iSelfControl Feasibility and Pilot Studies. *PLoS ONE* 11(10) doi.org/10.1371/journal.pone.0164229

Schuch, V., Utsumi, D. A., Costa, T. V. M. M., Kulikowski, L. D., & Muszkat, M. (2015). Attention deficit hyperactivity disorder in the light of the epigenetic paradigm. *Frontiers in psychiatry*, 6, 126. doi.org/10.3389/fpsyg.2015.00126

Scruggs, T. E., & Mastropieri, M. A. (1989). Reconstructive elaborations: A model for content area learning. *American Educational Research Journal*, 26(2), 311-327. <https://doi.org/10.2307/1163035>.

Seabrook, E., Kelly, R., Foley, F., Theiler, S., Thomas, N., Wadley, G., & Nedeljkovic, M. (2020). Understanding how virtual reality can support mindfulness practice: Mixed methods study. *Journal of medical Internet research*, 22(3), e16106. doi: 10.2196/16106.

Ståhl, A., Höök, K., Svensson, M., Taylor, A. S., & Cometto, M. (2009). Experiencing the affective diary. *Personal and Ubiquitous Computing*, 13(5), 365-378.

Steiner, N. J., Frenette, E. C., Rene, K. M., Brennan, R. T., & Perrin, E. C. (2014). Neurofeedback and cognitive attention training for children with attention-

deficit hyperactivity disorder in schools. *Journal of Developmental & Behavioral Pediatrics*, 35(1), 18-27.

Sunitha, S., & Sharma, C. P. (2021) Mudra Therapy and Its Classification. International Journal of Health Sciences & Research.vol11 (1): 118-126

Thapar, A., Cooper, M., Eyre, O., & Langley, K. (2013). Practitioner review: what have we learnt about the causes of ADHD?. *Journal of Child Psychology and Psychiatry*, 54(1), 3-16. doi.org/10.1111/j.1469-7610.2012.02611.x

Thomas, B. L., & Viljoen, M. (2016). EEG brain wave activity at rest and during evoked attention in children with attention-deficit/hyperactivity disorder and effects of methylphenidate. *Neuropsychobiology*, 73(1), 16-22.

Tripp, G., & Wickens, J. R. (2009). Neurobiology of ADHD. *Neuropharmacology*, 57(7-8), 579-589. doi.org/10.1016/j.neuropharm.2009.07.026

Yang, G., Lai, C. S. W., Cichon, J., Ma, L., Li, W., & Gan, W. B. (2014). Sleep promotes branch-specific formation of dendritic spines after learning. *Science*, 344(6188), 1173-1178. doi: 10.1126/science.1249098

Van Kesteren, M. T. R., & Meeter, M. (2020). How to optimize knowledge construction in the brain. *npj Science of Learning*, 5(1), 1-7. doi.org/10.1038/s41539-020-0064-y

Verschaffel, L., Depaepe, F., & Mevarech, Z. (2019). Learning Mathematics in metacognitively oriented ICT-Based learning environments: A systematic review of the literature. *Education Research International*, 2019. doi.org/10.1155/2019/3402035

Virta, M., Hiltunen, S., Mattsson, M., & Kallio, S. (2015). The impact of hypnotic suggestions on reaction times in continuous performance test in adults with ADHD and healthy controls. *PloS one*, 10(5), e0126497. doi:10.1371/journal.pone.0126497

Wagner, I. C., Konrad, B. N., Schuster, P., Weisig, S., Repantis, D., Ohla, K., ... & Dresler, M. (2021). Durable memories and efficient neural coding through mnemonic training using the method of loci. *Science Advances*, 7(10), eabc7606

Wigal, S. B., Emmerson, N., Gehricke, J. G., & Galassetti, P. (2013). Exercise: applications to childhood ADHD. *Journal of attention disorders*, 17(4), 279-290. doi.org/10.1177/1087054712454192

Xu, G., Strathearn, L., Liu, B., Yang, B., & Bao, W. (2018). Twenty-year trends in diagnosed attention-deficit/hyperactivity disorder among US children and adolescents, 1997-2016. *JAMA network open*, 1(4), e181471-e181471. doi:10.1001/jamanetworkopen.2018.1471

Εφαρμογές

Healthy Visions, ADHD Concentration: Noble Isle, Healthy Visions, 2017, <https://play.google.com/store/apps/details?id=com.healthyvisions.nobleisle>
(Ανακτήθηκε στις 05.05.2021)

Super Powers for Super Kids, App Store. (n.d.). <https://apps.apple.com/au/app/super-powers-for-super-kids/id860725094> (Ανακτήθηκε στις 05.05.2021).