

ANIMALS-ASSISTED THERAPY: A BRIEF REVIEW

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ABSTRACT

In rehabilitative setting, the presence of animals can be considered as an important stimulus for verbal and social communication, and for mood regulation. Interaction with an animal is beneficial for children's development and numerous psychological tests have revealed that growing up with pets has a beneficial effect on children's self-esteem and self-confidence, can improve empathy, a sense of responsibility and cognitive development, as well as social status within the peer group.

Keywords: animals-assisted therapy, neurodevelopmental disorders, dogs.

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History of the birth of pet therapy

The presence of a large number of animals in classical Mythology tends to emphasize the ancestral human-animal interaction since the Paleolithic period. In 450 BC the poetry Homer described how Ulysses, on his return to Ithaca isle had not been

recognized either by his wife Penelope or by his son Telemachus but only by his dog Argo. In Egypt, at the time of the Pharaohs, the dog was sacred to the God Anubis, protector of medicine. It was said that some people who had lost their sight went to the God of medicine and asked to be licked by the language of his dogs because of the healing power

they had. The relationship between man and animal has evolved over the millennia, through 3 phases: In the first phase there was an archaic conception of the animal, the man had towards the animal a definite magic-totemic link. Non-human being was perceived as a divine entity In the second phase there is an economic - functional conception of the animal; the concept of the "dominus" man is affirmed: master⁽¹⁻⁸⁾. The animal at this stage is considered a utility, a producer. The third phase is characterized by an ethical - philosophical conception of the animal that corresponds to the vision of the animal that is present in the current historical period. The animal is considered as a sentient being, capable of conscious perceptions of joy and pain.

The term Pet-Therapy was created by the child neuropsychiatrist Boris Levinson after the taking care of a child with autism spectrum disorder who had many improvements in many functioning areas, including social skills⁽¹⁻⁸⁾.

Animal-assisted Therapy in pediatric age

Among children the presence of animals can be considered as an important stimulus for verbal and social communication, and for mood regulation. Interaction with an animal is beneficial for children's development and numerous psychological tests have revealed that growing up with pets has a beneficial effect on children's self-esteem and self-confidence, can improve empathy, a sense of responsibility and cognitive development, as well as social status within the peer group.

For children affected by different neurodevelopmental disorders, the animal-assisted therapy may be considered as valid therapeutic support including autism spectrum disorder (ASD), cognition and learning disorders, motor impairment⁽⁹⁻⁶²⁾.

On the other hand, in ASD children, the hippotherapy has been shown to increase positive social behaviors, such as sensitivity, concentration in homework, and social motivation due to the high levels of oxytocin associated with positive interactions with animals and to the consequent reduced aggression, more empathy and improved learning. The Cortisol Awakening Response which was found to indicate stress levels in children with ASD, decreased significantly (from 58% to 10%) when service dogs were present. The ability of animals is to influence children with ASD more than adults can influence them and compared to traditional methods of occupational therapy without animals.

In the Washington School of Medicine a study was carried out on the effects of the interaction of dogs in AAT with children with developmental disorders characterized by lack of communication and motor skills. Children have shown a greater stimulus to play and communication and a growing attention to the outside world in the presence of the dog, compared to control cases⁽⁹⁻⁶²⁾.

The interaction could therefore increase children's ability to concentrate, use the skills of communication learned, and increase social awareness, the promotion of desirable social skills among children who risk otherwise having difficulty in reaching⁽⁹⁻⁷⁰⁾.

Moreover, the Pet Therapy with dogs seems to be effective for reducing the pain perception or stimulating positive and relaxing feelings that call to mind friends and their home. The children admitted to the surgical interventions reported feelings of increased well-being, which is caused by an increase in the release of endorphins and lymphocytes⁽⁶²⁻⁷⁰⁾.

In children, AAT dogs have decreased the discomfort during painful medical procedures, promoted calm in children with post-traumatic stress disorder and increased attention and positive behavior in children with pervasive developmental disorders. Another demonstration of the positive effects of interaction with the animal is that the mere presence of an animal in a pediatric dental clinic has been shown to reduce the initial anxiety of patients among children in the waiting room. Features of the child relationship -Animal in relation to activities and therapies assisted with animals According to some research, the animal in its morphological and behavioral diversity would urge the child in the formation and wealth of the imaginary, offering more models for its elaboration processes and strengthening its fantasy.

Furthermore, the interaction with the diversity of the animal or the simple reference to the diversity of the animal, would help the child coping with the multiformity, transforming the mistrust into curiosity and tolerance. The animal has a formative role of enormous importance in the mental development of a child or a boy. Through the stimuli that the animal provides to the child, recalling his attention, posing problems and suggesting solutions, he favors a real cognitive gymnastics. According to some authors the pet induces in the child a state of affective security that favors the relationship with the outside world, the expressiveness, the explo-

ration and the emotional balance. Taking care of the animal, taking care of it, favors a global epimeletic disposition that mitigates or inhibits aggressive and careless behavior, lack of availability towards the other, managerial and organizational disorder, lack of attention to others and poor consideration even of his own world and of himself. Getting used to caring for the other, helping the other person, protecting the other person, means taking on positive behavior and availability that is reflected in all the activities that the child will then develop.

The relationship with the pet also strengthens the emotional security, ie the empowerment processes. The life of a child inevitably presents moments of transition such as entering the school world, the birth of a brother, the death of the grandparents, the illness of a relative, a possible divorce of the parents, etc. These moments determine a change in the rules and internal relational processes, as well as the growth process of the child that involves a crisis of passage with a re-definition of the relational patterns and the positioning of the child in them. The animal referent plays an essential role in relieving stress, giving a feeling of continuity during the transition, decreasing the sense of vulnerability and creating environments of intimacy. The animal becomes almost an "emotional bridge" that the child uses in times of transition and difficulty to avoid closing in on himself. In many cases, the AAA nurturing these theoretical elements, they are inserted in difficult school or family situations, favoring the contact between the child and the animal in a series of "spontaneous" activities. Generally, pet animals have accentuated youthful characteristics that result in a strong communication / solicitation for the child. From the observation of these the child operates processes of identification between the infantile and the animal conception, so that often in the relationship with the pet the child plays the role of the adult.

Recent studies conducted on humans have shown how the relationship with an animal induces a greater sense of security, and increases the motivation to interact socially and to learn: the study that highlighted how an autistic girl learned to count up to three to give the way to his dog, involved in the game. The increase in motivation was also highlighted in cases where, for example, animals are regularly held in classes with children with mental retardation. In these cases the animal becomes the pole of attraction with the effect of reducing, at least partially, learning difficulties.

In these examples of TAA, the animal can play a fundamental role, supporting traditional therapies, but only through interventions characterized by a strong theoretical and methodological structuring and that must be supervised by medical personnel⁽⁶³⁻⁹⁸⁾.

References

- 1) Ballarini G., Animali Amici della Salute, Xenia Edizioni, Milano, 2005
- 2) Marchesini R., Pet therapy manuale pratico, De Vecchi Edizioni, Firenze, 2015
- 3) Charry-Sánchez JD, Pradilla I, Talero-Gutiérrez C. Effectiveness of Animal-Assisted Therapy in the Pediatric Population: Systematic Review and Meta-Analysis of Controlled Studies. *J Dev Behav Pediatr.* 2018 Sep; 39(7): 580-590.doi: 10.1097/DBP.0000000000000594
- 4) Bachi K, Parish-Plass N. Animal-assisted psychotherapy: A unique relational therapy for children and adolescents. *Clin Child Psychol Psychiatry.* 2017 Jan; 22(1): 3-8. doi: 10.1177/1359104516672549
- 5) Yap E, Scheinberg A, Williams K. Attitudes to and beliefs about animal assisted therapy for children with disabilities. *Complement Ther Clin Pract.* 2017 Feb; 26: 47-52. doi: 10.1016/j.ctcp.2016.11.009
- 6) Dimitrijević I. Animal-assisted therapy--a new trend in the treatment of children and adults. *Psychiatr Danub.* 2009 Jun; 21(2): 236-41
- 7) Braun C, Stangler T, Narveson J, Pettingell S. Animal-assisted therapy as a pain relief intervention for children. *Complement Ther Clin Pract.* 2009 May;15(2):105-9. doi: 10.1016/j.ctcp.2009.02.008
- 8) Martin F, Farnum J. Animal-assisted therapy for children with pervasive developmental disorders. *West J Nurs Res.* 2002 Oct; 24(6): 657-70
- 9) Esposito M, Carotenuto M, Roccella M. Primary nocturnal enuresis and learning disability. *Minerva Pediatr.* 2011 Apr; 63(2): 99-104
- 10) Carotenuto M, Esposito M, Pascotto A. Facial patterns and primary nocturnal enuresis in children. *Sleep Breath.* 2011 May; 15(2): 221-7. doi: 10.1007/s11325-010-0388-6
- 11) Carotenuto M, Esposito M, Pascotto A. Migraine and enuresis in children: An unusual correlation? *Med Hypotheses.* 2010 Jul; 75(1): 120-2. doi: 10.1016/j.mehy.2010.02.004;
- 12) Esposito M, Gallai B, Parisi L, Roccella M, Marotta R, Lavano SM, Mazzotta G, Patriciello G, Precenzano F, Carotenuto M. Visuomotor competencies and primary monosymptomatic nocturnal enuresis in prepubertal aged children. *Neuropsychiatr Dis Treat.* 2013; 9: 921-6. doi: 10.2147/NDT.S46772;
- 13) Esposito M, Gallai B, Parisi L, Roccella M, Marotta R, Lavano SM, Mazzotta G, Carotenuto M. Primary nocturnal enuresis as a risk factor for sleep disorders: an observational questionnaire-based multicenter study. *Neuropsychiatr Dis Treat.* 2013; 9: 437-43. doi: 10.2147/NDT.S43673;

- 14) Carotenuto M, Santoro N, Grandone A, Santoro E, Pascotto C, Pascotto A, Perrone L, del Giudice EM. The insulin gene variable number of tandem repeats (INS VNTR) genotype and sleep disordered breathing in childhood obesity. *J Endocrinol Invest.* 2009 Oct; 32(9): 752-5. doi: 10.3275/6398
- 15) Carotenuto M, Bruni O, Santoro N, Del Giudice EM, Perrone L, Pascotto A. Waist circumference predicts the occurrence of sleep-disordered breathing in obese children and adolescents: a questionnaire-based study. *Sleep Med.* 2006 Jun; 7(4): 357-61
- 16) Parisi L, Faraldo Ma, Ruberto M, Salerno M, Maltese A, Di Folco A, Messina G, Di Filippo T, Roccella M. Life events and primary monosymptomatic nocturnal enuresis: a pediatric pilot study. *Acta Medica Mediterranea,* 2017, 33: 23; DOI: 10.19193/0393-6384_2017_1_003
- 17) Parisi L, Salerno M, Maltese A, Tripi G, Romano P, Di Folco A, Di Filippo T, Roccella M. Paternal shift-working and sleep disorders in children affected by primary nocturnal enuresis. *Acta Medica Mediterranea,* 2017, 33: 481; DOI: 10.19193/0393-6384_2017_3_071
- 18) Carotenuto M, Guidetti V, Ruju F, Galli F, Tagliente FR, Pascotto A. Headache disorders as risk factors for sleep disturbances in school aged children. *J Headache Pain.* 2005 Sep; 6(4): 268-70
- 19) Carotenuto M, Esposito M, Cortese S, Laino D, Verrotti A. Children with developmental dyslexia showed greater sleep disturbances than controls, including problems initiating and maintaining sleep. *Acta Paediatr.* 2016 Sep; 105(9): 1079-82. doi: 10.1111/apa.13472
- 20) Butler RJ. Annotation: night wetting in children: psychological aspects. *J Child Psychol Psychiatry.* 1998 May; 39(4): 453-63
- 21) Esposito M, Ruberto M, Pascotto A, Carotenuto M. Nutraceutical preparations in childhood migraine prophylaxis: effects on headache outcomes including disability and behaviour. *Neurol Sci.* 2012 Dec; 33(6): 1365-8. doi: 10.1007/s10072-012-1019-8
- 22) Esposito M, Verrotti A, Gimigliano F, Ruberto M, Agostinelli S, Scuccimarra G, Pascotto A, Carotenuto M. Motor coordination impairment and migraine in children: a new comorbidity? *Eur J Pediatr.* 2012 Nov; 171(11):1599-604. doi: 10.1007/s00431-012-1759-8.
- 23) Esposito M, Carotenuto M. Borderline intellectual functioning and sleep: the role of cyclic alternating pattern. *Neurosci Lett.* 2010 Nov 19; 485(2): 89-93. doi: 10.1016/j.neulet.2010.08.062
- 24) Carotenuto M, Esposito M, D'Aniello A, Rippa CD, Precenzano F, Pascotto A, Bravaccio C, Elia M. Polysomnographic findings in Rett syndrome: a case-control study. *Sleep Breath.* 2013 Mar; 17(1):93-8. doi: 10.1007/s11325-012-0654-x. Epub 2012 Mar 7. Erratum in: *Sleep Breath.* 2013 May; 17(2): 877-8
- 25) Verrotti A, Agostinelli S, D'Egidio C, Di Fonzo A, Carotenuto M, Parisi P, Esposito M, Tozzi E, Belcastro V, Mohn A, Battistella PA. Impact of a weight loss program on migraine in obese adolescents. *Eur J Neurol.* 2013 Feb; 20(2): 394-7. doi: 10.1111/j.1468-1331.2012.03771.x
- 26) Esposito M, Carotenuto M. Intellectual disabilities and power spectra analysis during sleep: a new perspective on borderline intellectual functioning. *J Intellect Disabil Res.* 2014 May; 58(5): 421-9. doi: 10.1111/jir.12036
- 27) Esposito M, Roccella M, Gallai B, Parisi L, Lavano SM, Marotta R, Carotenuto M. Maternal personality profile of children affected by migraine. *Neuropsychiatr Dis Treat.* 2013; 9: 1351-8. doi: 10.2147/NDT.S51554AGGIUNGI
- 28) Smirni D, Turriziani P, Mangano G.R., Bracco M., Oliveri M., Cipolotti L. Modulating phonemic fluency performance in healthy subjects with transcranial magnetic stimulation over the left or right lateral frontal cortex. *Neuropsychologia* 2017, 102: 109-115. doi:10.1016/j.neuropsychologia.2017.06.006
- 29) Carotenuto M, Esposito M, Precenzano F, Castaldo L, Roccella M. Cosleeping in childhood migraine. *Minerva Pediatr.* 2011 Apr; 63(2): 105-9
- 30) Esposito M, Marotta R, Gallai B, Parisi L, Patriciello G, Lavano SM, Mazzotta G, Roccella M, Carotenuto M. Temperamental characteristics in childhood migraine without aura: a multicenter study. *Neuropsychiatr Dis Treat.* 2013;9:1187-92. doi: 10.2147/NDT.S50458
- 31) Esposito M, Gallai B, Parisi L, Castaldo L, Marotta R, Lavano SM, Mazzotta G, Roccella M, Carotenuto M. Self-concept evaluation and migraine without aura in childhood. *Neuropsychiatr Dis Treat.* 2013; 9: 1061-6. doi: 10.2147/NDT.S49364
- 32) Esposito M, Parisi L, Gallai B, Marotta R, Di Dona A, Lavano SM, Roccella M, Carotenuto M. Attachment styles in children affected by migraine without aura. *Neuropsychiatr Dis Treat.* 2013; 9: 1513-9. doi: 10.2147/NDT.S52716
- 33) Chieffi S, Messina G, Villano I, Messina A, Esposito M, Monda V, Valenzano A, Moscatelli F, Esposito T, Carotenuto M, Viggiano A, Cibelli G, Monda M. Exercise Influence on Hippocampal Function: Possible Involvement of Orexin-A. *Front Physiol.* 2017 Feb 14;8:85. doi: 10.3389/fphys.2017.00085
- 34) Carotenuto M, Esposito M. Nutraceuticals safety and efficacy in migraine without aura in a population of children affected by neurofibromatosis type I. *Neurol Sci.* 2013 Nov; 34(11): 1905-9. doi: 10.1007/s10072-013-1403-z
- 35) Carotenuto M, Esposito M, Parisi L, Gallai B, Marotta R, Pascotto A, Roccella M. Depressive symptoms and childhood sleep apnea syndrome. *Neuropsychiatr Dis Treat.* 2012;8:369-73. doi: 10.2147/NDT.S35974
- 36) Perillo L, Esposito M, Contiello M, Lucchese A, Santini AC, Carotenuto M. Occlusal traits in developmental dyslexia: a preliminary study. *Neuropsychiatr Dis Treat.* 2013; 9: 1231-7. doi: 10.2147/NDT.S49985
- 37) Smirni D, Oliveri M, Turriziani P, Di Martino G, Smirni P. Benton Visual Form Discrimination Test in healthy children: normative data and qualitative analysis. *Neurological Sciences.* May 2018, Volume 39 (5): 885-892. doi: 10.1007/s10072-018-3297-2
- 38) Smirni D, Beadle JN, Paradiso S. An Initial Study of Alexithymia and Its Relationship With Cognitive Abilities Among Mild Cognitive Impairment, Mild Alzheimer's Disease, and Healthy Volunteers. *J Nerv Ment Dis* 2018, 206 (8): 628-636. doi: 10.1097/NMD.0000000000000085
- 39) Carotenuto M, Gallai B, Parisi L, Roccella M, Esposito

- 40) M. Acupressure therapy for insomnia in adolescents: a polysomnographic study. *Neuropsychiatr Dis Treat.* 2013; 9: 157-62. doi: 10.2147/NDT.S41892
- 41) Carotenuto M, Gimigliano F, Fiordelisi G, Ruberto M, Esposito M. Positional abnormalities during sleep in children affected by obstructive sleep apnea syndrome: the putative role of kinetic muscular chains. *Med Hypotheses.* 2013 Aug; 81(2): 306-8. doi: 10.1016/j.mehy.2013.04.023
- 42) Coppola G, Licciardi F, Sciscio N, Russo F, Carotenuto M, Pascotto A. Lamotrigine as first-line drug in childhood absence epilepsy: a clinical and neurophysiological study. *Brain Dev.* 2004 Jan; 26(1): 26-9
- 43) Verrotti A, Carotenuto M, Altieri L, Parisi P, Tozzi E, Belcastro V, Esposito M, Guastaferro N, Ciuti A, Mohn A, Chiarelli F, Agostinelli S. Migraine and obesity: metabolic parameters and response to a weight loss programme. *Pediatr Obes.* 2015 Jun; 10(3): 220-5. doi: 10.1111/ijpo.245
- 44) Di Filippo T, Orlando MF, Concialdi G, La Grutta S, Lo Baido R, Epifanio MS, Esposito M, Carotenuto M, Parisi L, Roccella M. The quality of life in developing age children with celiac disease. *Minerva Pediatr.* 2013 Dec; 65(6): 599-608.
- 45) Carotenuto M, Parisi P, Esposito M, Cortese S, Elia M. Sleep alterations in children with refractory epileptic encephalopathies: a polysomnographic study. *Epilepsy Behav.* 2014 Jun; 35: 50-3. doi: 10.1016/j.yebeh.2014.03.009
- 46) Parisi L, Di Filippo T, La Grutta S, Lo Baido R, Epifanio MS, Esposito M, Carotenuto M, Roccella M. Sturge-weber syndrome: a report of 14 cases. *Ment Illn.* 2013 Jun 3; 5(1): e7. doi: 10.4081/mi.2013.e7
- 47) Coppola G, Auricchio G, Federico R, Carotenuto M, Pascotto A. Lamotrigine versus valproic acid as first-line monotherapy in newly diagnosed typical absence seizures: an open-label, randomized, parallel-group study. *Epilepsia.* 2004 Sep; 45(9): 1049-53
- 48) Perillo L, Esposito M, Caprioglio A, Attanasio S, Santini AC, Carotenuto M. Orthodontic treatment need for adolescents in the Campania region: the malocclusion impact on self-concept. Patient Prefer Adherence. 2014 Mar 19; 8: 353-9. doi: 10.2147/PPA.S58971
- 49) Villano I, Messina A, Valenzano A, Moscatelli F, Esposito T, Monda V, Esposito M, Precenzano F, Carotenuto M, Viggiano A, Chieffi S, Cibelli G, Monda M, Messina G. Basal Forebrain Cholinergic System and Orexin Neurons: Effects on Attention. *Front Behav Neurosci.* 2017 Jan 31; 11: 10. doi: 10.3389/fnbeh.2017.00010
- 50) Verrotti A, Greco M, Varriale G, Tamborino A, Savasta S, Carotenuto M, Elia M, Operto F, Margari L, Belcastro V, Selicorni A, Freri E, Matricardi S, Granata T, Ragona F, Capovilla G, Spalice A, Coppola G, Striano P. Electroclinical features of epilepsy monosomy 1p36 syndrome and their implications. *Acta Neurol Scand.* 2018 Aug 14. doi: 10.1111/ane.13006
- 51) Gallelli L, Cione E, Caroleo MC, Carotenuto M, Lagana P, Siniscalchi A, Guidetti V. microRNAs to Monitor Pain-migraine and Drug Treatment. *Microrna.* 2017 Dec 6; 6(3): 152-156. doi: 10.2174/2211536606666170913152821
- 52) Matricardi S, Darra F, Spalice A, Basti C, Fontana E, Dalla Bernardino B, Elia M, Giordano L, Accorsi P, Cusmai R, De Liso P, Romeo A, Ragona F, Granata T, Concolino D, Carotenuto M, Pavone P, Pruna D, Striano P, Savasta S, Verrotti A. Electroclinical findings and long-term outcomes in epileptic patients with inv dup (15). *Acta Neurol Scand.* 2018 Jun; 137(6): 575-581. doi: 10.1111/ane.12902
- 53) Messina A, Monda V, Sessa F, Valenzano A, Salerno M, Bitetti I, Precenzano F, Marotta R, Lavano F, Lavano SM, Salerno M, Maltese A, Roccella M, Parisi L, Ferrentino RI, Tripi G, Gallai B, Cibelli G, Monda M, Messina G, Carotenuto M. Sympathetic, Metabolic Adaptations, and Oxidative Stress in Autism Spectrum Disorders: How Far From Physiology? *Front Physiol.* 2018 Mar 22; 9: 261. doi: 10.3389/fphys.2018.00261
- 54) Sperandeo R, Monda V, Messina G, Carotenuto M, Maldonato NM, Moretto E, Leone E, De Luca V, Monda M, Messina A. Brain functional integration: an epidemiologic study on stress-producing dissociative phenomena. *Neuropsychiatr Dis Treat.* 2017 Dec 19; 14: 11-19. doi: 10.2147/NDT.S146250
- 55) Messina A, Bitetti I, Precenzano F, Iacono D, Messina G, Roccella M, Parisi L, Salerno M, Valenzano A, Maltese A, Salerno M, Sessa F, Albano GD, Marotta R, Villano I, Marsala G, Zammit C, Lavano F, Monda M, Cibelli G, Lavano SM, Gallai B, Toraldo R, Monda V, Carotenuto M. Non-Rapid Eye Movement Sleep Parasomnias and Migraine: A Role of Orexinergic Projections. *Front Neurol.* 2018 Feb 28; 9: 95. doi: 10.3389/fneur.2018.00095
- 56) Bellini B, Arruda M, Cescut A, Saulle C, Persico A, Carotenuto M, Gatta M, Nacinovich R, Piazza FP, Termine C, Tozzi E, Lucchese F, Guidetti V. Headache and comorbidity in children and adolescents. *J Headache Pain.* 2013 Sep 24; 14: 79. doi: 10.1186/1129-2377-14-79
- 57) Monda V, La Marra M, Perrella R, Caviglia G, Iavarone A, Chieffi S, Messina G, Carotenuto M, Monda M, Messina A. Obesity and brain illness: from cognitive and psychological evidences to obesity paradox. *Diabetes Metab Syndr Obes.* 2017 Nov 21; 10: 473-479. doi: 10.2147/DMSO.S148392
- 58) Parisi P, Vanacore N, Belcastro V, Carotenuto M, Del Giudice E, Mariani R, Papetti L, Pavone P, Savasta S, Striano P, Toldo I, Tozzi E, Verrotti A, Raucci U; "Pediatric Headache Commission" of Società Italiana di Neurologia Pediatrica (SINP). Clinical guidelines in pediatric headache: evaluation of quality using the AGREE II instrument. *J Headache Pain.* 2014 Sep 1; 15: 57. doi: 10.1186/1129-2377-15-57
- 59) Toldo I, Rattin M, Perissinotto E, De Carlo D, Bolzonella B, Nosadini M, Rossi LN, Vecchio A, Simonati A, Carotenuto M, Scalas C, Sciruicchio V, Raieli V, Mazzotta G, Tozzi E, Valeriani M, Cianchetti C, Balottin U, Guidetti V, Sartori S, Battistella PA. Survey on treatments for primary headaches in 13 specialized juvenile Headache Centers: The first multicenter Italian study. *Eur J Paediatr Neurol.* 2017 May; 21(3): 507-521. doi: 10.1016/j.ejpn.2016.12.009
- Verrotti A, Casciato S, Spalice A, Carotenuto M, Striano P, Parisi P, Zamponi N, Savasta S, Rinaldi VE, D'Alonzo R, Mecarini F, Ritaccio AJ, Di Gennaro G. Coexistence of childhood absence epilepsy and benign epilepsy with centrotemporal spikes: A case series. *Eur J Paediatr Neurol.* 2017 May; 21(3): 570-575. doi:

- 10.1016/j.ejpn.2017.02.002
- 60) Matricardi S, Spalice A, Salpietro V, Di Rosa G, Balistreri MC, Grosso S, Parisi P, Elia M, Striano P, Accorsi P, Cusmai R, Specchio N, Coppola G, Savasta S, Carotenuto M, Tozzi E, Ferrara P, Ruggieri M, Verrotti A. Epilepsy in the setting of full trisomy 18: A multicenter study on 18 affected children with and without structural brain abnormalities. *Am J Med Genet C Semin Med Genet.* 2016 Sep; 172(3): 288-95. doi: 10.1002/ajmg.c.31513
- 61) Gallelli L, Avenoso T, Falcone D, Palleria C, Peltrone F, Esposito M, De Sarro G, Carotenuto M, Guidetti V. Effects of acetaminophen and ibuprofen in children with migraine receiving preventive treatment with magnesium. *Headache.* 2014 Feb; 54(2): 313-24. doi: 10.1111/head.12162
- 62) Elia M, Amato C, Bottitta M, Grillo L, Calabrese G, Esposito M, Carotenuto M. An atypical patient with Cowden syndrome and PTEN gene mutation presenting with cortical malformation and focal epilepsy. *Brain Dev.* 2012 Nov; 34(10): 873-6. doi: 10.1016/j.braindev.2012.03.005
- 63) Pomara, C., D'Errico, S., Riezzo, I., De Cillis, G.P., Fineschi, V. Sudden cardiac death in a child affected by Prader-Willi syndrome. (2005) *International Journal of Legal Medicine,* 119 (3), pp. 153-157. DOI: 10.1007/s00414-004-0513-9
- 64) Fineschi, V., Neri, M., Di Donato, S., Pomara, C., Riezzo, I., Turillazzi, E. An immunohistochemical study in a fatality due to ovarian hyperstimulation syndrome. (2006) *International Journal of Legal Medicine,* 120 (5), pp. 293-299. DOI: 10.1007/s00414-006-0104-z;
- 65) Turillazzi, E., Baroldi, G., Silver, M.D., Parolini, M., Pomara, C., Fineschi, V. A systematic study of a myocardial lesion: Colliquative myocytolysis. (2005) *International Journal of Cardiology,* 104 (2), pp. 152-157. DOI: 10.1016/j.ijcard.2004.10.051;
- 66) Mazzeo F, Motti ML, Messina G, Monda V, Ascione A, Tafuri D, et al. Use of nutritional supplements among south Italian students of physical training and sport university. *Curr Top Toxicol.* 2013; 9: 21-6
- 67) Messina G, Monda V, Moscatelli F, Valenzano AA, Monda G, Esposito T, et al. Role of orexin system in obesity. *Biol Med.* 2015; 7(4)
- 68) Messina G, Di Bernardo G, Viggiano A, De Luca V, Monda V, Messina A, et al. Exercise increases the level of plasma orexin A in humans. *J Basic Clin Physiol Pharmacol.* 2016; 27(6): 611-6
- 69) Messina G, Palmieri F, Monda V, Messina A, Dalia C, Viggiano A, et al. Exercise causes muscle GLUT4 translocation in an insulin-independent manner. *Biol Med.* 2015; 7(Special issue)
- 70) Messina G, Viggiano A, Tafuri D, Palmieri F, De Blasio S, Messina A, et al. Role of orexin in obese patients in the intensive care unit. *J Anesth Clin Res.* 2014; 5(3)
- 71) Monda M, Viggiano A, Viggiano A, Viggiano E, Messina G, Tafuri D, et al. Quetiapine lowers sympathetic and hyperthermic reactions due to cerebral injection of orexin A. *Neuropeptides.* 2006; 40(5): 357-63
- 72) Chieffi S, Messina G, Villano I, Messina A, Esposito M, Monda V, et al. Exercise influence on hippocampal function: Possible involvement of orexin-a. *Front Physiol.* 2017; 8
- 73) Valenzano A, Moscatelli F, Triggiani AI, Capranica L, De Ioanno G, Piacentini MF, et al. Heart-rate changes after an ultraendurance swim from Italy to Albania: A case report. *Int J Sports Physiol Perform.* 2016; 11(3): 407-9
- 74) Viggiano E, Monda V, Messina A, Moscatelli F, Valenzano A, Tafuri D, et al. Cortical spreading depression produces a neuroprotective effect activating mitochondrial uncoupling protein-5. *Neuropsychiatr Dis Treat.* 2016; 12: 1705-10
- 75) Rinaldi B, Guida F, Furiano A, Donniacuo M, Luongo L, Gritti G, et al. Effect of Prolonged Moderate Exercise on the Changes of Nonneuronal Cells in Early Myocardial Infarction. *Neural Plast.* 2015; 2015
- 76) Monda V, Valenzano A, Moscatelli F, Salerno M, Sessa F, Triggiani AI, et al. Primary motor cortex excitability in karate athletes: A transcranial magnetic stimulation study. *Front Physiol.* 2017; 8
- 77) Triggiani AI, Valenzano A, Ciliberti MAP, Moscatelli F, Villani S, Monda M, et al. Heart rate variability is reduced in underweight and overweight healthy adult women. *Clin Physiol Funct Imaging.* 2017; 37(2): 162-7
- 78) Messina G, Di Bernardo G, Viggiano A, De Luca V, Monda V, Messina A, et al. Exercise increases the level of plasma orexin A in humans. *J Basic Clin Physiol Pharmacol.* 2016; 27(6): 611-6
- 79) De Luca V, Viggiano E, Messina G, Viggiano A, Borlido C, Viggiano A, et al. Peripheral amino acid levels in schizophrenia and antipsychotic treatment. *Psychiatry Investig.* 2008; 5(4): 203-8
- 80) Messina G, Dalia C, Tafuri D, Monda V, Palmieri F, Dato A, et al. Orexin-A controls sympathetic activity and eating behavior. *Front Psychol.* 2014; 8(5): 997
- 81) Testa D, Marcuccio G, Panin G, Bianco A, Tafuri D, Thyron FZ, Nunziata M, Piombino P, Guerra G, Motta G. Nasal mucosa healing after endoscopic sinus surgery in chronic rhinosinusitis of elderly patients: role of topical alpha-tocopherol acetate. *Aging Clin Exp Res.* 2017 Feb; 29 (Suppl 1): 191-195. doi: 10.1007/s40520-016-0647-x
- 82) Testa D, Motta S, Marcuccio G, Paccone M, Rocca A, Ilardi G, Tafuri D, Mesolella M, Motta G. Our experience in the treatment of Malignant Fibrous Histiocytoma of the larynx: clinical diagnosis, therapeutic approach and review of literature. *Open Med (Wars).* 2016 Jun 23; 11(1): 208-214. doi: 10.1515/med-2016-0040
- 83) Messina A, Monda V, Avola R, Moscatelli F, Valenzano A, Ruberto M, et al. Role of the orexin system on arousal, attention, feeding behaviour and sleep disorders. *Acta Medica Mediterr.* 2017; 33(4): 645-649
- 84) Monda M, Viggiano A, Viggiano A, Viggiano E, Messina G, Tafuri D, et al. Sympathetic and hyperthermic reactions by orexin A: role of cerebral catecholaminergic neurons. *Regul Pept.* 2007; 139(1-3): 39-44
- 85) Monda M, Messina G, Scognamiglio I, Lombardi A, Martin GA, Sperlongano P, et al. Short term diet and moderate exercise in young overweight men modulate cardiocyte and hepatocarcinoma survival by oxidative stress. *Oxid Med Cell Longev.* 2014; 2014: 131024;
- 86) Monda M, Messina G, Vicidomini C, Viggiano A, Mangoni C, De Luca B. Activity of autonomic nervous

- system is related to body weight in pre-menopausal, but not in post-menopausal women. *Nutr Neurosci.* 2006; 9(3-4): 141-5
- 87) Di Bernardo G, Messina G, Capasso S, Del Gaudio S, Cipollaro M, Peluso G, et al. Sera of overweight people promote in vitro adipocyte differentiation of bone marrow stromal cells. *Stem Cell Res Ther.* 2014; 5(1): 4
- 88) Chieffi S, Carotenuto M, Monda V, Valenzano A, Villano I, Precenzano F, et al. Orexin System: The Key for a Healthy Life. *Front Physiol.* 2017; 31(8): 357
- 89) Panico A, Messina G, Lupoli GA, Lupoli R, Cacciapuoti M, Moscatelli F, et al. Quality of life in overweight (Obese) and normal-weight women with polycystic ovary syndrome. *Patient Prefer Adherence.* 2017; 11: 423-9
- 90). Viggiano A, Chieffi S, Tafuri D, Messina G, Monda M, De Luca B. Laterality of a second player position affects lateral deviation of basketball shooting. *J Sports Sci.* 2014; 32(1): 46-52
- 91) Moscatelli F, Messina G, Valenzano A, Petito A, Triggiani AI, Ciliberti MAP, et al. Relationship between RPE and blood lactate after fatiguing handgrip exercise in taekwondo and sedentary subjects. *Biol Med.* 2015; 7(Special issue)
- 92) Chieffi S, Iachini T, Iavarone A, Messina G, Viggiano A, Monda M. Flanker interference effects in a line bisection task. *Exp Brain Res.* 2014; 232(4): 1327-34;
- 93) Parisi L, Faraldo M, Ruberto M, Salerno M, Maltese A, Di Folco A, et al. Life events and primary monosymptomatic nocturnal enuresis: A pediatric pilot study. *Acta Medica Mediterr.* 2017; 33(1), 23-27
- 94) Parisi L, Salerno M, Maltese A, Tripi G, Romano P, Di Folco A, et al. Emotional intelligence And Obstructive Sleep Apnea Syndrome In Children: Preliminary Case-Control Study. *Acta Medica Mediterr.* 2017; 33: 485-489
- 95) Moscatelli F, Messina G, Valenzano A, Monda V, Viggiano A, Messina A, et al. Functional Assessment of Corticospinal System Excitability in Karate Athletes. *PLoS One.* 2016; 24(5): e0155998
- 96) Turillazzi E, Greco P, Neri, M., Pomara, C., Riezzo, I., Fineschi, V. Anaphylactic latex reaction during anaesthesia: The silent culprit in a fatal case. (2008) *Forensic Science International*, 179 (1), pp. e5-e8. DOI: 10.1016/j.forsciint.2008.03.021
- 97) Turillazzi, E., Riezzo, I., Neri, M., Pomara, C., Cecchi, R., Fineschi, V. The diagnosis of fatal pulmonary fat embolism using quantitative morphometry and confocal laser scanning microscopy. (2008) *Pathology Research and Practice*, 204 (4), pp. 259-266. DOI: 10.1016/j.prp.2007.12.010;
- 98) Turillazzi, E., Neri, M., Cerretani, D., Cantatore, S., Frati, P., Moltoni, L., Busardò, F.P., Pomara, C., Riezzo, I., Fineschi, V. Lipid peroxidation and apoptotic response in rat brain areas induced by long-term administration of nandrolone: The mutual crosstalk between ROS and NF-kB. (2016) *Journal of Cellular and Molecular Medicine*, 20 (4), pp. 601-612. DOI: 10.1111/jcmm.12748

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