

EATING AND FEEDING DISORDERS IN PEDIATRIC AGE

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ABSTRACT

Eating and feeding disorders are common in pediatric age and may be important to discover and recover the early symptoms in order to optimize the treatment and management.

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Introduction

During the first three years of life the distinction between self and other begins; the styles of attachment and relationship are constructed; the body scheme and the mental image of the body are drawn; language and symbolic thought emerge; the regulatory capacities of emotional states and the strategies for organizing behavioral responses are founded and

developed. In all this, nutrition plays a vital role. For a child to feed does not just mean satisfying a biological need, but it is a moment full of emotional, psychological and relational values. Nutrition, as an essential condition for harmonious and optimal growth, must take into account the different phases of a child's life, characterized by nutritional needs, evolving physiological and behavioral skills⁽¹⁻⁷⁾.

Since birth, the child is driven by mechanisms of physiological and homeostatic regulation, through which he gradually becomes aware of his hunger and satiety, mobilizing strategies to communicate the interest in food, when he is hungry, and his rejection of the same when it is full. With respect to the acquisition of such self-regulating capacities, the mother-child affective communication system appears to be central in preparing the latter for the transition from a system of mutual food regulation to autonomous feeding.

Under optimal conditions, during breast-feeding mother and child show reciprocal involvement and tuning, evident in the gestures and vocalizations of both; the mother is able to recognize and adapt to the signs of hunger and satiety of the child, to his need to take a break and perhaps to communicate with her. This creates a “dance rhythm”, since the child not only learns how to regulate sucking behavior, but also interacts with the mother through the alternation of the shifts.

Weaning, which takes place between 7 and 9 months, is a very delicate moment of development, in which we see mother and child interact in an amplified way. The latter is more active and communicative, takes initiatives, manipulates food, but can also oppose the same, for example by spitting or clenching his lips. In this phase the sensitivity of the mother in supporting the curiosity and the natural push towards the autonomy of the child is fundamental, thus increasing her feelings of trust and self-efficacy. In the transition to autonomous feeding, the evolutionary tasks related to the “separation-individuation process” have an important meaning from the food point of view and it is precisely through the exploration of food (use of the spoon, food handling, etc.) that the child begins to enjoy the pleasure of feeling independent, a necessary element for building a stable self-esteem. In light of what has been said, the social and affective experiences connected to the nutrition of the very first years of life, appear to be a fundamental organizer of biological rhythms, but also of the child’s Self⁽⁸⁻¹⁵⁾.

According to some authors, in these periods, it is common to observe the refusal behavior of food - characterized by oppositional attitudes on the part of the child and by an apparent lack of interest in food - as an expression of a normal maturational process involving a series of affective components, biological-physiological and cognitive, and that does not compromise the development of the child nor its relationship with the primary figures.

However, it is necessary to differentiate these transitory food difficulties, easily solved, by a real eating disorder characterized by a specific symptomatology.

Early childhood Behavioral Disorders constitute a psychopathological category of heterogeneous nature, within which it is possible to identify various disorders, various etiologies and specific outcomes. One child in four has problems with food, yet pediatric food difficulties still represent an obscure and fragmentary chapter in both the medical and psychological fields. Eating disorders are widely studied conditions in adolescents and adults while in the developmental age they constitute a territory whose map is still confused and for which very different nomenclatures and classifications coexist. Signals important for early diagnosis are then all those behaviors that we attribute to secondary adult importance, namely the way children eat, often characterized by slowness, exclusion of certain foods, ingestion of a lot of water, crumbling of food in very small pieces, etc.⁽¹⁶⁻²⁵⁾.

In the opinion of some scholars, the presence of problems in the parent-child relationship can make the processes of mutual regulation and self-sufficiency of the child during the eating experience particularly difficult. As a result, the importance of examining emerged the interconnections between the development of self-regulatory functions (gold-pharyngeal automatisms, sensorimotor capacities, praxis, cognitive, regulation and consolidation of hunger-satiety cycles) and the emotional and environmental experiences of the child. Given the early onset and the symptomatology variety of eating disorders in the developmental age, it becomes increasingly important to have diagnostic classifications that act as points of reference and that allow to distinguish transient discomforts and subclinical forms, from established clinical pictures.

In recent years, thanks to research in the field of infantile mental health, the approach to developmental psychopathology has undergone important transformations, leading to an improvement in diagnostic and therapeutic methods. The growing awareness of the importance of early diagnosis and timely treatment, as essential elements for the modification of the natural history of diseases, has urged the adaptation of the common international diagnostic systems to the specific characteristics of the young child. In fact, it has emerged clearly that the clinical-diagnostic evaluation of eating disorders in childhood should take into consideration the characteristics of the child

and of attachment figures, together with their relational dynamics both in the context of life and along the continuum of development⁽²⁶⁻³⁵⁾.

Problems and criticism of current DSM criteria for eating disorders

The category "Nutrition Disorder in Infancy or Early Childhood" has been used very rarely, and there is little information about the characteristics of the children who suffer from it.

One of the first criticisms of this category concerns the excessive importance given to weight loss or loss of weight as a necessary condition for determining this problem; it may happen that a child with this type of eating disorder, despite avoiding food, is able to gain or maintain adequate weight (probably due to a dependence on food supplements), thus excluding the diagnosis of this disorder.

Another limitation to the definition of the DSM-IV refers to the criterion according to which the onset must necessarily take place before 6 years of age. In fact, according to this nosographic system, children with food problems that arise after 6 years can not be diagnosed with a disorder of this kind. Therefore, even if the disorder is clinically significant, if it occurs beyond the age established by the criterion, the diagnosis of "Eating Disorder in childhood or early childhood" disappears and the subjects may not receive the treatment appropriate to their condition. .

Furthermore, the definition of eating disorders in childhood does not include, among its criteria, the possibility that the disorder may be complementary to another pathology; in reality it is common to find in an individual with an eating disorder the presence of coexisting medical problems.

To address these obvious problems with the publication of the fifth edition of the manual, the avoidant / restrictive food intake disorder (ARFID) was introduced by the English acronym Avoidant / Restrictive Food Intake Disorder) was introduced in place of the feeding Disorder. childhood or early childhood. This new category, in fact, is destined to capture not only individuals who meet the criteria for the existing category of DSM-IV-TR, but also other subjects with clinically significant food problems that are not included in the already defined categories.

Lask B. and Bryant Waugh R. have described the difficult application in the evolutionary age of the criteria used by the DSM⁽³⁶⁾.

In particular, these authors underlined the following aspects:

1) Weight loss. The DSM excludes children who weigh more than 85% of the estimated weight and who, however, have inadequate eating behaviors or put in place maneuvers designed to lose weight.

Furthermore, children with low growth in height as a result of malnutrition may present a body mass index falsely in the norm, because to estimate it, a height already compromised by malnutrition is taken as a reference; in this way weight loss can be underestimated in younger children.

2) Concern for form and body weight. In medium-childhood or preadolescent subjects, the DSM-IV-TR criteria are not easy to apply because of the difficulty they present in verbalizing the fear of getting fat even if they have a low weight.

3) The amenorrhea. This criterion is essential for the diagnosis of anorexia nervosa in post-menarche women, but may not be relevant in young girls who have yet to develop it.

To overcome the difficulties in using the DSM, the two authors outlined other criteria that will be described in section.

The eating disorder may have a particularly early onset in the case of the newborn (the problem manifests itself more with crying, colic, interruption of suction, hyperexcitability, irritability) or appear between the first and second year of life, configuring in typical frameworks of food waste, characterized by oppositional attitudes on the part of the child and by an apparent lack of interest in food.

The denial of the child who refuses to open his mouth, moves away from the food, arches, spits it, turns the dish upside down, expresses anger, makes gagging, and observes together with the mother's behavior to force the feeding⁽³⁷⁻⁴⁵⁾.

The disorder usually appears during the transition to autonomous feeding; for example, the child manifests a persistent rejection or extreme selectivity of food, sometimes an intense conflict with the attachment figure; the interactive exchanges between mother and child can be characterized by a struggle for control, in which the child's obstinacy and stubbornness are opposed to the mother's difficulties in managing the negative and opposing responses posed by the child.

The following are some of the typical manifestations that we find in childhood eating disorders and that characterize the picture.

Difficulty in recognizing and regulating emotions

Under normal conditions the self-regulation process of one's internal states develops starting from the continuous interweaving of the child's innate capacities - which organize the myriad of tactile, visual, acoustic and proprioceptive sensations coming from the external and internal world - and the repeated interactions of the mother-child dyad, around the achievement of homeostasis. The child's regulation system is basically a dyadic system that depends on the child as much as on the primary caregiver.

Children with eating disorders are fundamentally alexithymic, as they present a deficit in the recognition of their internal states (hunger, satiety, sense of emptiness), in the exploration of their inner world and in the skills necessary to recognize and express their emotions. The lack of information on one's state of well-being and one's own desires and needs hinders the creation of stable borders with others, consequently increasing dependence on the external environment in order to have confirmations and certainties⁽⁴⁶⁻⁵⁰⁾.

So if a child has difficulties in regulating their emotions and impulses, the cause can be attributed to unfavorable interactions between the temperamental and environmental factors, as described below.

When faced with a child who experiences negative feelings, which can be emotions or physical pains, the adult, who can not recognize the needs of his child, uses as a remedy to reduce the discomfort of food or the "pacifier". With a mother who has difficulty in correctly reading the child's signals and responding appropriately, the child will associate the feeding moment and the interaction with her, negative emotional states and it will become difficult for him to regulate the need for food starting from sensations physiological hunger-satiety and distinguish these from the emotional experiences of frustration, anger or desire. The lack of an appropriate sharing of affects, on which the child constructs his own experiences of effectiveness and self-awareness, determines, as the Bruch points out, that the "child grows full of perplexity and confusion whenever he tries to distinguish his physiological needs being hungry or being full, from interpersonal emotional experiences"⁽⁵¹⁻⁵²⁾.

Selectivity and sensory aversions

The extreme selectivity of food can lead to nutritional deficits as well as delayed oral motor development. The child's adverse reaction to the introduction of certain foods leads to expressions of disgust, vomiting or complete refusal to eat. Rejected foods are often non-family foods (neophobia) or that have particular characteristics in taste, consistency or smell. The range of foods with which these children feed is really very small: sometimes it provides only four or five categories of food. Nevertheless some of these children are physically healthy because they are able to take the proper nutrients.

The main problem of these subjects is the condition of social unease caused by food restriction, which becomes even more evident when, during adolescence, occasions for conviviality and affective and social relationships increase. These sensory problems can therefore generate, at the time of the meal, high levels of anxiety, fear, anguish, negatively affecting nutrition and, more generally, the daily life of the subject⁽⁵³⁻⁵⁶⁾.

Distorted perception of one's body

Food dynamics and the course of development can take on complex and diversified meanings, and represent privileged areas of vulnerability for the emergence of a disorder. If in the child the refusal of food is linked to constitutional factors or to the lack of reciprocity with the attachment figure, for the adolescent it has a completely different meaning: "to improve" one's appearance. The perception that the adolescent has of his own body, or the way in which his mind has formed the idea of his body and its forms, seems to influence his life more than his own real image.

For example, those suffering from anorexia seem unable to look at themselves objectively; the image that refers to the mirror is in his eyes that of a fat person. With the beginning of an obvious weight loss the subject can present a state of euphoria and satisfaction, which also favors a situation of hyperactivity: it is the phase in which the subject engages in physical activities, carried out in ways that, for commitment and repetitiveness, they are indicative of an aberrant concern for weight and body image. For people who are suffering from bulimia, the anxiety can be even stronger because the "normal" weight is generally considered an abnormal weight and is experienced with great discomfort and shame.

In both cases the evaluation of oneself depends excessively on the weight and shape of one's body. In fact, these disorders are often associated with other psychiatric conditions, in particular depression, but also anxiety disorders, obsessive-compulsive disorder and personality disorders. Self-aggression behaviors may be present, such as self-injurious acts and suicide attempts. This kind of disorders occupy a very particular space in the psychiatry field, since besides "striking" the mind, and therefore causing intense psychic suffering, they also involve the body with physical complications sometimes so serious as to make it necessary hospitalization⁽⁵⁷⁻⁸²⁾.

References

- 1) Panico A, Messina G, Lupoli GA, Lupoli R, Cacciapuoti M, Moscatelli F, Esposito T, Villano I, Valenzano A, Monda V, Messina A, Precenzano F, Cibelli G, Monda M, Lupoli G. Quality of life in overweight (obese) and normal-weight women with polycystic ovary syndrome. *Patient Prefer Adherence*. 2017 Mar 2; 11: 423-429. doi: 10.2147/PPA.S119180;
- 2) Chieffi S, Messina G, Villano I, Messina A, Valenzano A, Moscatelli F, Salerno M, Sullo A, Avola R, Monda V, Cibelli G, Monda M. Neuroprotective Effects of Physical Activity: Evidence from Human and Animal Studies. *Front Neurol*. 2017 May 22; 8: 188. doi: 10.3389/fneur.2017.00188;
- 3) Messina G, Di Bernardo G, Viggiano A, De Luca V, Monda V, Messina A, Chieffi S, Galderisi U, Monda M. Exercise increases the level of plasma orexin A in humans. *J Basic Clin Physiol Pharmacol*. 2016 Nov 1; 27(6): 611-616. doi: 10.1515/jbpcpp-2015-0133;
- 4) Chieffi S, Iachini T, Iavarone A, Messina G, Viggiano A, Monda M. Flanker interference effects in a line bisection task. *Exp Brain Res*. 2014 Apr; 232(4): 1327-34. doi: 10.1007/s00221-014-3851-y;
- 5) Verrotti A, Agostinelli S, D'Egidio C, Di Fonzo A, Carotenuto M, Parisi P, Esposito M, Tozzi E, Belcastro V, Mohn A, Battistella PA. (2013) Impact of a weight loss program on migraine in obese adolescents. *Eur J Neurol*. Feb;20(2):394-7. doi: 10.1111/j.1468-1331.2012.03771.x
- 6) Carotenuto M, Bruni O, Santoro N, Del Giudice EM, Perrone L, Pascotto A. (2006) Waist circumference predicts the occurrence of sleep-disordered breathing in obese children and adolescents: a questionnaire-based study. *Sleep Med*. Jun; 7(4): 357-61
- 7) Verrotti A, Carotenuto M, Altieri L, Parisi P, Tozzi E, Belcastro V, Esposito M, Guastaferrò N, Ciuti A, Mohn A, Chiarelli F, Agostinelli S. (2015) Migraine and obesity: metabolic parameters and response to a weight loss programme. *Pediatr Obes*. Jun; 10(3): 220-5. doi: 10.1111/ijpo.245
- 8) Monda V, La Marra M, Perrella R, Caviglia G, Iavarone A, Chieffi S, Messina G, Carotenuto M, Monda M, Messina A. (2017) Obesity and brain illness: from cognitive and psychological evidences to obesity paradox. *Diabetes Metab Syndr Obes*. Nov 21; 10: 473-479. doi: 10.2147/DMSO.S148392
- 9) Esposito M, Gallai B, Roccella M, Marotta R, Lavano F, Lavano SM, Mazzotta G, Bove D, Sorrentino M, Precenzano F, Carotenuto M. (2014) Anxiety and depression levels in prepubertal obese children: a case-control study. *Neuropsychiatr Dis Treat*. Oct 3; 10: 1897-902. doi: 10.2147/NDT.S69795
- 10) 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. (2017) Exercise Influence on Hippocampal Function: Possible Involvement of Orexin-A. *Front Physiol*. Feb 14; 8: 85. doi: 10.3389/fphys.2017.00085
- 11) Esposito M, Carotenuto M. (2010) Borderline intellectual functioning and sleep: the role of cyclic alternating pattern. *Neurosci Lett*. Nov 19; 485(2): 89-93. doi: 10.1016/j.neulet.2010.08.062
- 12) Esposito M, Ruberto M, Pascotto A, Carotenuto M. (2012) Nutraceutical preparations in childhood migraine prophylaxis: effects on headache outcomes including disability and behaviour. *Neurol Sci*. Dec; 33(6): 1365-8. doi: 10.1007/s10072-012-1019-8
- 13) Esposito M, Verrotti A, Gimigliano F, Ruberto M, Agostinelli S, Scuccimarra G, Pascotto A, Carotenuto M. (2012) Motor coordination impairment and migraine in children: a new comorbidity? *Eur J Pediatr*. Nov; 171(11): 1599-604. doi: 10.1007/s00431-012-1759-8.
- 14) Carotenuto M, Santoro N, Grandone A, Santoro E, Pascotto C, Pascotto A, Perrone L, del Giudice EM. (2009) The insulin gene variable number of tandem repeats (INS VNTR) genotype and sleep disordered breathing in childhood obesity. *J Endocrinol Invest*. Oct;32(9):752-5. doi: 10.3275/6398.
- 15) 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. (2013) Headache and comorbidity in children and adolescents. *J Headache Pain*. Sep 24; 14: 79. doi: 10.1186/1129-2377-14-79
- 16) Carotenuto M, Guidetti V, Ruju F, Galli F, Tagliente FR, Pascotto A. (2005) Headache disorders as risk factors for sleep disturbances in school aged children. *J Headache Pain*. Sep; 6(4): 268-70
- 17) Carotenuto M, Esposito M, Cortese S, Laino D, Verrotti A. (2016) Children with developmental dyslexia showed greater sleep disturbances than controls, including problems initiating and maintaining sleep. *Acta Paediatr*. Sep; 105(9): 1079-82. doi: 10.1111/apa.13472
- 18) Carotenuto M, Esposito M, D'Aniello A, Ripa CD, Precenzano F, Pascotto A, Bravaccio C, Elia M. (2013) Polysomnographic findings in Rett syndrome: a case-control study. *Sleep Breath*. 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
- 19) Esposito M, Carotenuto M. (2014) Intellectual disabilities and power spectra analysis during sleep: a new perspective on borderline intellectual functioning. *J Intellect Disabil Res*. May; 58(5): 421-9. doi: 10.1111/jir.12036
- 20) Esposito M, Roccella M, Gallai B, Parisi L, Lavano SM, Marotta R, Carotenuto M. (2013) Maternal personality profile of children affected by migraine.

- Neuropsychiatr Dis Treat. 9: 1351-8. doi: 10.2147/NDT.S51554
- 21) Carotenuto M, Esposito M, Precenzano F, Castaldo L, Roccella M. (2011) Cosleeping in childhood migraine. *Minerva Pediatr. Apr*; 63(2): 105-9
 - 22) Esposito M, Marotta R, Gallai B, Parisi L, Patriciello G, Lavano SM, Mazzotta G, Roccella M, Carotenuto M. (2013) Temperamental characteristics in childhood migraine without aura: a multicenter study. *Neuropsychiatr Dis Treat. 9: 1187-92. doi: 10.2147/NDT.S50458*
 - 23) Esposito M, Gallai B, Parisi L, Castaldo L, Marotta R, Lavano SM, Mazzotta G, Roccella M, Carotenuto M. (2013) Self-concept evaluation and migraine without aura in childhood. *Neuropsychiatr Dis Treat. 9: 1061-6. doi: 10.2147/NDT.S49364*
 - 24) Esposito M, Parisi L, Gallai B, Marotta R, Di Dona A, Lavano SM, Roccella M, Carotenuto M. (2013) Attachment styles in children affected by migraine without aura. *Neuropsychiatr Dis Treat. 9: 1513-9. doi: 10.2147/NDT.S52716*
 - 25) Carotenuto M, Gallai B, Parisi L, Roccella M, Esposito M. (2013) Acupressure therapy for insomnia in adolescents: a polysomnographic study. *Neuropsychiatr Dis Treat. 9:157-62. doi: 10.2147/NDT.S41892*
 - 26) Carotenuto M, Gimigliano F, Fiordelisi G, Ruberto M, Esposito M. (2013) Positional abnormalities during sleep in children affected by obstructive sleep apnea syndrome: the putative role of kinetic muscular chains. *Med Hypotheses. Aug*; 81(2): 306-8. doi: 10.1016/j.mehy.2013.04.023
 - 27) Coppola G, Licciardi F, Sciscio N, Russo F, Carotenuto M, Pascotto A. (2004) Lamotrigine as first-line drug in childhood absence epilepsy: a clinical and neurophysiological study. *Brain Dev. Jan*;26(1):26-9
 - 28) Esposito M, Pascotto A, Gallai B, Parisi L, Roccella M, Marotta R, Lavano SM, Gritti A, Mazzotta G, Carotenuto M. (2012) Can headache impair intellectual abilities in children? An observational study. *Neuropsychiatr Dis Treat. 8:509-13. doi: 10.2147/NDT.S36863.*
 - 29) Esposito M, Gallai B, Parisi L, Roccella M, Marotta R, Lavano SM, Gritti A, Mazzotta G, Carotenuto M. (2013) Maternal stress and childhood migraine: a new perspective on management. *Neuropsychiatr Dis Treat. 9: 351-5. doi: 10.2147/NDT.S42818.*
 - 30) Esposito M, Parisi P, Miano S, Carotenuto M. (2013) Migraine and periodic limb movement disorders in sleep in children: a preliminary case-control study. *J Headache Pain. Jul 1*; 14: 57. doi: 10.1186/1129-2377-14-57
 - 31) Esposito M, Gallai B, Parisi L, Roccella M, Marotta R, Lavano SM, Mazzotta G, Patriciello G, Precenzano F, Carotenuto M. (2013) Visuomotor competencies and primary monosymptomatic nocturnal enuresis in prepubertal aged children. *Neuropsychiatr Dis Treat. 9: 921-6. doi: 10.2147/NDT.S46772*
 - 32) Esposito M, Carotenuto M. (2011) Ginkgolide B complex efficacy for brief prophylaxis of migraine in school-aged children: an open-label study. *Neurol Sci. Feb*; 32(1): 79-81. doi: 10.1007/s10072-010-0411-5
 - 33) Esposito M, Roccella M, Parisi L, Gallai B, Carotenuto M. (2013) Hypersomnia in children affected by migraine without aura: a questionnaire-based case-control study. *Neuropsychiatr Dis Treat. 9: 289-94. doi: 10.2147/NDT.S42182*
 - 34) Carotenuto M, Esposito M, Pascotto A. (2011) Facial patterns and primary nocturnal enuresis in children. *Sleep Breath. May*; 15(2): 221-7. doi: 10.1007/s11325-010-0388-6
 - 35) Carotenuto M, Esposito M. (2013) Nutraceuticals safety and efficacy in migraine without aura in a population of children affected by neurofibromatosis type I. *Neurol Sci. Nov*; 34(11): 1905-9. doi: 10.1007/s10072-013-1403-z
 - 36) Carotenuto M, Esposito M, Parisi L, Gallai B, Marotta R, Pascotto A, Roccella M. (2012) Depressive symptoms and childhood sleep apnea syndrome. *Neuropsychiatr Dis Treat. 8: 369-73. doi: 10.2147/NDT.S35974*
 - 37) Esposito M, Carotenuto M, Roccella M. (2011) Primary nocturnal enuresis and learning disability. *Minerva Pediatr. Apr* ;63(2): 99-104
 - 38) Perillo L, Esposito M, Contiello M, Lucchese A, Santini AC, Carotenuto M. (2013) Occlusal traits in developmental dyslexia: a preliminary study. *Neuropsychiatr Dis Treat. 9: 1231-7. doi: 10.2147/NDT.S49985*
 - 39) Esposito M, Marotta R, Roccella M, Gallai B, Parisi L, Lavano SM, Carotenuto M. (2014) Pediatric neurofibromatosis 1 and parental stress: a multicenter study. *Neuropsychiatr Dis Treat. Jan 22*; 10: 141-6. doi: 10.2147/NDT.S55518.
 - 40) Lask B., Bryant Waugh R, (1995) Annotation: eating disorders in children. *J. Child Psychol. Psychiat.*Vol. 36, 2: 191-202
 - 41) Carotenuto M, Esposito M, Pascotto A. (2010) Migraine and enuresis in children: An unusual correlation? *Med Hypotheses. Jul*; 75(1): 120-2. doi: 10.1016/j.mehy.2010.02.004
 - 42) Esposito M, Precenzano F, Sorrentino M, Avolio D, Carotenuto M. (2015) A Medical Food Formulation of Griffonia simplicifolia/Magnesium for Childhood Periodic Syndrome Therapy: An Open-Label Study on Motion Sickness. *J Med Food. Aug*; 18(8): 916-20. doi: 10.1089/jmf.2014.0113
 - 43) Esposito M, Ruberto M, Gimigliano F, Marotta R, Gallai B, Parisi L, Lavano SM, Roccella M, Carotenuto M. (2013) Effectiveness and safety of Nintendo Wii Fit Plus™ training in children with migraine without aura: a preliminary study. *Neuropsychiatr Dis Treat. 9: 1803-10. doi: 10.2147/NDT.S53853*
 - 44) Di Filippo T, Orlando MF, Concialdi G, La Grutta S, Lo Baido R, Epifanio MS, Esposito M, Carotenuto M, Parisi L, Roccella M. (2013) The quality of life in developing age children with celiac disease. *Minerva Pediatr. Dec*; 65(6): 599-608.
 - 45) Carotenuto M, Parisi P, Esposito M, Cortese S, Elia M. (2014) Sleep alterations in children with refractory epileptic encephalopathies: a polysomnographic study. *Epilepsy Behav. Jun*; 35: 50-3. doi: 10.1016/j.yebeh.2014.03.009
 - 46) Esposito M, Gimigliano F, Ruberto M, Marotta R, Gallai B, Parisi L, Lavano SM, Mazzotta G, Roccella M, Carotenuto M. (2013) Psychomotor approach in children affected by nonretentive fecal soiling (FNRFs): a new rehabilitative purpose. *Neuropsychiatr Dis Treat. 9: 1433-41. doi: 10.2147/NDT.S51257*

- 47) Parisi L, Di Filippo T, La Grutta S, Lo Baido R, Epifanio MS, Esposito M, Carotenuto M, Roccella M. (2013) Sturge-weber syndrome: a report of 14 cases. *Ment Illn.* Jun 3; 5(1): e7. doi: 10.4081/mi.2013.e7
- 48) Coppola G, Auricchio G, Federico R, Carotenuto M, Pascotto A. (2004) Lamotrigine versus valproic acid as first-line monotherapy in newly diagnosed typical absence seizures: an open-label, randomized, parallel-group study. *Epilepsia.* Sep; 45(9): 1049-53
- 49) Perillo L, Esposito M, Caprioglio A, Attanasio S, Santini AC, Carotenuto M. (2014) Orthodontic treatment need for adolescents in the Campania region: the malocclusion impact on self-concept. *Patient Prefer Adherence.* Mar 19;8:353-9. doi: 10.2147/PPA.S58971
- 50) Esposito M, Antinolfi L, Gallai B, Parisi L, Roccella M, Marotta R, Lavano SM, Mazzotta G, Precenzano F, Carotenuto M. (2013) Executive dysfunction in children affected by obstructive sleep apnea syndrome: an observational study. *Neuropsychiatr Dis Treat.* 9: 1087-94. doi: 10.2147/NDT.S47287
- 51) 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. (2017) Basal Forebrain Cholinergic System and Orexin Neurons: Effects on Attention. *Front Behav Neurosci.* Jan 31; 11: 10. doi: 10.3389/fnbeh.2017.00010
- 52) 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. (2018) Electroclinical features of epilepsy monosomy 1p36 syndrome and their implications. *Acta Neurol Scand.* Aug 14. doi: 10.1111/ane.13006
- 53) Gallelli L, Cione E, Caroleo MC, Carotenuto M, Lagana P, Siniscalchi A, Guidetti V. (2017) microRNAs to Monitor Pain-migraine and Drug Treatment. *Microna.* Dec 6; 6(3): 152-156. doi: 10.2174/221153660666170913152821
- 54) Matricardi S, Darra F, Spalice A, Basti C, Fontana E, Dalla Bernardina 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. (2018) Electroclinical findings and long-term outcomes in epileptic patients with inv dup (15). *Acta Neurol Scand.* Jun; 137(6): 575-581. doi: 10.1111/ane.12902
- 55) Esposito M, Messina A, Monda V, Bitetti I, Salerno F, Precenzano F, Pisano S, Salvati T, Gritti A, Marotta R, Lavano SM, Lavano F, Maltese A, Parisi L, Salerno M, Tripi G, Gallai B, Roccella M, Bove D, Ruberto M, Toraldo R, Messina G, Carotenuto M. (2017) The Rorschach Test Evaluation in Chronic Childhood Migraine: A Preliminary Multicenter Case-Control Study. *Front Neurol.* Dec 12; 8: 680. doi: 10.3389/fneur.2017.00680
- 56) 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.0000000000000853
- 57) 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. (2018) Sympathetic, Metabolic Adaptations, and Oxidative Stress in Autism Spectrum Disorders: How Far From Physiology? *Front Physiol.* Mar 22; 9: 261. doi: 10.3389/fphys.2018.00261
- 58) Sperandeo R, Monda V, Messina G, Carotenuto M, Maldonato NM, Moretto E, Leone E, De Luca V, Monda M, Messina A. (2017) Brain functional integration: an epidemiologic study on stress-producing dissociative phenomena. *Neuropsychiatr Dis Treat.* Dec 19; 14: 11-19. doi: 10.2147/NDT.S146250
- 59) 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. (2018) Non-Rapid Eye Movement Sleep Parasomnias and Migraine: A Role of Orexinergic Projections. *Front Neurol.* Feb 28; 9: 95. doi: 10.3389/fneur.2018.00095.
- 60) Esposito M, Gimigliano F, Barillari MR, Precenzano F, Ruberto M, Sepe J, Barillari U, Gimigliano R, Militerni R, Messina G, Carotenuto M. (2017) Pediatric selective mutism therapy: a randomized controlled trial. *Eur J Phys Rehabil Med.* Oct 53(5): 643-650. doi: 10.23736/S1973-9087.16.04037-5
- 61) Esposito M, Gallai B, Parisi L, Roccella M, Marotta R, Lavano SM, Mazzotta G, Carotenuto M. (2013) Primary nocturnal enuresis as a risk factor for sleep disorders: an observational questionnaire-based multicenter study. *Neuropsychiatr Dis Treat.* 9: 437-43. doi: 10.2147/NDT.S43673
- 62) 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). (2014) Clinical guidelines in pediatric headache: evaluation of quality using the AGREE II instrument. *J Headache Pain.* Sep 1; 15: 57. doi: 10.1186/1129-2377-15-57
- 63) Toldo I, Rattin M, Perissinotto E, De Carlo D, Bolzonella B, Nosadini M, Rossi LN, Vecchio A, Simonati A, Carotenuto M, Scalas C, Scirucchio V, Raieli V, Mazzotta G, Tozzi E, Valeriani M, Cianchetti C, Balottin U, Guidetti V, Sartori S, Battistella PA. (2017) Survey on treatments for primary headaches in 13 specialized juvenile Headache Centers: The first multicenter Italian study. *Eur J Paediatr Neurol.* May; 21(3): 507-521. doi: 10.1016/j.ejpn.2016.12.009
- 64) Albenzio M, Santillo A, Ciliberti MG, Figliola L, Caroprese M, Polito AN, Messina G. Milk nutrition and childhood epilepsy: an ex vivo study on cytokines and oxidative stress in response to milk protein fractions. *J Dairy Sci.* 2018 Jun; 101(6): 4842-4852. Doi: 10.3168/Jds.2017-13104
- 65) Albenzio M, Santillo A, Ciliberti MG, Figliola L, Caroprese M, Marino R, Polito AN. Milk from different species: relationship between protein fractions and inflammatory response in infants affected by generalized epilepsy. *J Dairy Sci.* 2016 Jul; 99(7): 5032-5038. Doi: 10.3168/Jds.2015-10704
- 66) Albenzio M, Santillo A, Caroprese M, Polito AN. Role

- of milk from small ruminant species on human health. Nutrients in dairy and their implications for health and disease. 21 June 2017, Pages 435-440
- 67) 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
- 68) 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.S51554
- 69) 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
- 70) 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
- 71) 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
- 72) 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
- 73) 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
- 74) Valenzano A, Moscatelli F, Triggiani AI, Capranica L, De Ioannon 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
- 75) Messina G, Dalia C, Tafuri D, Monda V, Palmieri F, Dato A, Russo A, De Blasio S, Messina A, De Luca V, Chieffi S, Monda M. Orexin-A controls sympathetic activity and eating behavior. *Front Psychol.* 2014 Sep 8; 5: 997. doi: 10.3389/fpsyg.2014.00997;
- 76) Rinaldi B, Guida F, Furiano A, Donniacuo M, Luongo L, Gritti G, Urbanek K, Messina G, Maione S, Rossi F, de Novellis V. Effect of Prolonged Moderate Exercise on the Changes of Nonneuronal Cells in Early Myocardial Infarction. *Neural Plast.* 2015; 2015: 265967. doi: 10.1155/2015/265967;
- 77) Monda M, Messina G, Scognamiglio I, Lombardi A, Martin GA, Sperlongano P, Porcelli M, Caraglia M, Stiuso P. 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. doi: 10.1155/2014/131024;
- 78) 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
- 79) 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;
- 80) 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
- 81) 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
- 82) 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.12748101

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