ORIGINAL RESEARCH

# Self-concept evaluation and migraine without aura in childhood

Maria Esposito[1]
Beatrice Gallai[2]
Lucia Parisi[3]
Laura Castaldo[1]
Rosa Marotta[4]
Serena Marianna Lavano[4]
Giovanni Mazzotta[5]
Michele Roccella[3]
Marco Carotenuto[1]

[1]Center for Childhood Headache, Clinic of Child and Adolescent Neuropsychiatry, Department of Mental Health, Physical and Preventive Medicine, Second University of Naples, Naples, Italy; [2]Unit of Child and Adolescent Neuropsychiatry, University of Perugia, Perugia, Italy; [3]Child Neuropsychiatry, Department of Psychology, University of Palermo, Palermo, Italy; [4]Department of Psychiatry, "Magna Graecia" University of Catanzaro, Catanzaro, Italy; [5]Unit of Child and Adolescent Neuropsychiatry, AUSL Umbria 2, Terni, Italy

Correspondence: Michele Roccella
Department of Psychology,
University of Palermo, Viale delle
Scienze ed 15, 90128 Palermo, Italy
Tel +39 091 2389 7756
Fax +39 091 651 3825
Email michele.roccella@unipa.it

**Introduction:** Self-esteem is related to the broadly understood concept of self-schemas and is a crucial mechanism for a correct psychological development in children and adolescents. The impact of the many psychological difficulties linked to the migraine without aura (MoA) and recurrent headache attacks, such as anger and separation anxiety, on self-esteem has not yet been well investigated. The aims of the present study were to assess self-esteem levels in an objective way and to verify their possible relationship and correlation with the frequency and intensity of migraine attacks, in a population of children and adolescents affected by MoA.

**Methods:** The study population was comprised of 185 children (88 males [M], 97 females [F]) aged between 6 and 12 years (mean $9.04 \pm 2.41$ years) referred consecutively for MoA to the Center for Childhood Headache, Clinic of Child and Adolescent Neuropsychiatry, Second University of Naples and of 203 healthy controls (95 M, 108 F) with mean age $9.16 \pm 2.37$ years, recruited from schools in Campania. The monthly headache frequency and the mean headache duration were assessed from daily headache diaries kept by all the children, and MoA intensity was assessed on a VAS (visual analog scale). To further evaluate their level of self-concept, all subjects filled out the Multidimensional Self-Concept Scale (MSCS).

**Results:** The two study groups were comparable for age ($P = 0.621$), sex ($P = 0.960$), and z-score BMI ($P = 0.102$). The MoA group showed a significant reduction in the MSCS total score ($P < 0.001$) and in the Social ($P < 0.001$), Affect ($P < 0.001$), Family ($P < 0.001$), and Physical ($P < 0.001$) domains of the MSCS compared with the control group. The Pearson's correlation analysis showed a significantly negative relationship between MoA clinical characteristics and MSCS scores, and similarly the frequency of attacks was significantly negatively related with the Social ($r = -0.3176$; $P < 0.001$), Competence ($r = -0.2349$; $P = 0.001$), Physical ($r = -0.2378$; $P = 0.001$), and total ($r = -0.2825$; $P < 0.001$) scores of the MSCS. On the other hand, the MoA duration was significantly negatively related with the Social ($r = -0.1878$; $P = 0.01$), Competence ($r = -0.2270$; $P = 0.002$), Physical ($r = -0.1976$; $P = 0.007$), and total ($r = -0.1903$; $P = 0.009$) scores of the MSCS.

**Conclusion:** Our study first identified differences in self-esteem levels, with an objective tool, in children affected by MoA compared with controls, suggesting the need for evaluation of self-esteem for better psychological pediatric management of children with migraine.

**Keywords:** children, self-esteem, MSCS

## Introduction

Migraine prevalence is around 15% in the European countries.[1,2] Migraine is a disabling condition in all ages and adversely affects patients' health-related quality of life (QoL) independently from comorbidities, such as mood or anxiety disorders,[3–6] and contributes to several difficulties in daily life. Because of this, the World Health

Organization (WHO) recognizes migraine as a high-priority public health problem.[7,8]

In fact, the disability associated with migraine seems to be strictly related to its severity and affects areas of function, such as communication, mobility, self-care, socialization, and relationships with peers[9] and with family members.[10,11]

Migraine without aura (MoA) is a primary headache that occurs frequently in childhood, with a prevalence ranging from 2% to17%.[12]

In general, during childhood, MoA is considered to be more than just a painful syndrome because it is often accompanied by many severe disabilities/impairments, such as low emotional functioning, school absenteeism, and impairment of academic performance and cognitive functioning,[12,13] motor coordination,[14] and sleep habits.[15–20]

Moreover, in the last 20 years, much attention has been paid to the presence of psychological difficulties and psychiatric comorbidity in children affected by primary headaches.[21–28]

To date, in clinical pediatric practice, many alternative therapies have been explored, such as weight loss,[29] nutraceuticals,[30–32] sleep hygiene,[33,34] psychotherapy, and generic psychological interventions,[35–37] and some have shown promise in the treatment of headache symptoms and/or comorbidities in affected children.

Among the many psychological difficulties reported to be associated with MoA and recurrent headache disorders in children, including anger and separation anxiety,[38] the quality of self-esteem remains underinvestigated.

Specifically, self-esteem could be defined as "a positive or negative attitude toward a particular object, namely, the self"[39] and in general, can be considered more precisely related to the concept of self-schemas, broadly understood as "cognitive generalizations about the self, derived from past experience, that organize and guide the processing of self-related information contained in the individual's social experiences."[40]

The aims of the present study were to assess self-esteem levels in an objective way and to verify the possible relationship and correlation of self-esteem with the frequency and intensity of migraine attacks, in a large population of children and adolescents affected by MoA.

## Materials and methods
### Study population

Data were collected from a pilot group (ten with MoA, and ten control children) and used to perform the sample size calculation. The desired power was set at 0.80 and

error at 0.05. The sample size was calculated using online software (http://www.dssresearch.com/toolkit/sscalc/size_a2.asp). The sample size required was found to be 39 subjects for each group, but there was the opportunity to recruit more patients in order to strengthen our findings. Therefore, the study population consisted of 185 children (88 males [M], 97 females [F]), aged between 6 and 12 years (mean 9.04 ± 2.41 years) consecutively referred for MoA to the Center for Childhood Headache, Clinic of Child and Adolescent Neuropsychiatry, Second University of Naples. The diagnosis of MoA was made according to the pediatric criteria of the International Headache Society Classification 2004.[1]

Exclusion criteria were neurological (ie, epilepsy, all type of headache except MoA) or psychiatric symptoms (Attention-Deficit Hyperactivity Disorder [ADHD], depression, or behavioral problems), mental retardation (IQ ≤ 70), borderline intellectual functioning (IQ ranging from 71 to 84),[41,42] overweight (body mass index [BMI] ≥85th percentile) or obese (BMI ≥ 95th percentile), or anticonvulsant or psychoactive drugs administration.

Following recruitment, there was a 4-month run-in period to verify headache characteristics.

At that end of the run-in period, monthly headache frequency and mean headache duration were assessed from daily headache diaries kept by all the children. Headache intensity was assessed on a visual analog scale (VAS), as previously reported.[30–32]

Children affected by MoA from at least 8 months were eligible for this study, and the minimum frequency was four attacks monthly, each lasting for a duration of one hour, according to the International Classification of Headache Disorders (ICHD)-II criteria.[1]

The results were compared with the findings obtained in a sample of 203 healthy controls (95 M, 108 F; mean age 9.16 ± 2.37 years) randomly selected from schools in the Campania region.

The subjects in both groups were recruited from the same urban area; participants were all Caucasian and were of middle-class socioeconomic status (between class 2 or class 3, corresponding to 28,000–55,000 euros/year to 55,000–75,000 euros/year, respectively, according to the current Italian economic legislation parameters). All parents gave their written informed consent. The Departmental Ethics Committee of the University of Palermo approved the design study.

The study was conducted according to the criteria of the Declaration of Helsinki.[43]

## Main outcome measures
### Multidimensional Self-Concept Scale
The Multidimensional Self-Concept Scale (MSCS)[44] measures global self-concept and six specific domains of self-concept: Social, Competence, Affect, Academic, Family, and Physical. Each domain consists of 25 items. Each item is scored from 1 (strongly agree) to 4 (strongly disagree). Negatively worded items are reverse scored. The raw global score and domain scores are calculated as sums of all items or of domain-specific items. The global and domain scores are then standardized (IQ metric) using the standard score conversions available in the user manual. A higher score indicates a more positive self-concept.

The MSCS was used to assess global and domain-specific self-concepts. The MSCS is a 150 item self-report inventory that is appropriate for either individual or group administration to youth between the ages of 9 and 19 years, inclusive. The MSCS provides a total score, as well as standard scores (mean = 100; standard deviation = 15) for each of six domain-specific scales (ie, Social, Competence, Affect, Academic, Family, and Physical).

Each of the six MSCS subscales is comprised of 25 items; thus each scale contributes equally to the total scale. The MSCS is based on a more comprehensive context-dependent, multidimensional model of social emotional adjustment and assessment.

The MSCS was normed on a national sample of 2,501 students, which was matched closely to national demographics. The scale was normed in 17 sites drawn from all four regions of the United States. Analysis of the MSCS data according to age, race, and sex have found only minor differences across the eleven age levels, both sex groups, and racial groups. Consistent with other self-concept measures, the MSCS appears to assess a robust construct that is fairly invariant across various demographic variables.

The MSCS examiner manual reports the total scale internal consistency at 0.98 for the entire sample; the internal consistency of the six scales ranges from 0.87 to 0.97 (median = 92). The MSCS total scale stability over a 4-week interval is 0.90, and the subscale stability coefficients range from 0.73 to 81. Fort this study, we used the Italian version of the MSCS.[45]

## Statistical analysis
In order to compare the characteristics (age, sex, and z-score BMI) and the MSCS results between MoA children and controls, Chi-square test and t-test, where appropriate, were applied.

Then, to explore the relationship between MSCS scores and clinical aspects of MoA, such as frequency and severity of attacks, Pearson's correlation test was applied.

For all statistical analysis, significant $P$-values $<0.05$ were considered.

All data were coded and analyzed using the commercially available STATISTICA 6.0 package for Windows (StatSoft, Inc, Tulsa, OK, USA).

## Results
No significant differences between the two study groups were found for age ($9.04 \pm 2.41$ in MoA group versus $9.16 \pm 2.37$ in the control group) ($P = 0.621$), sex (ratio M/F 88/97 in the MoA group versus 95/108 in the control group) ($P = 0.960$), and z-score BMI ($0.46 \pm 0.31$ in the MoA group versus $0.51 \pm 0.29$ in the control group) ($P = 0.102$).

Among the MoA clinical characteristics, in the MoA group, the attacks occurred with a mean frequency of $9.01 \pm 2.81$ times monthly, a mean duration of $6.22 \pm 2.61$ hours, and a mean intensity of $7.33 \pm 2.67$, according to VAS parameters.

The MoA group showed a significant reduction in MSCS total score and in the Social, Affect, Family, and Physical domains ($P < 0.001$) compared with the control group (Table 1).

Moreover, the Pearson's correlation analysis showed a significantly negative relationship between MoA clinical characteristics and the MSCS scores. Particularly, the MoA frequency was significantly negatively related with the Social ($r = -0.3176$) ($P < 0.001$), Competence ($r = -0.2349$) ($P = 0.001$), Physical ($r = -0.2378$) ($P = 0.001$), and total ($r = -0.2825$) ($P < 0.001$) scores of the MSCS.

On the other hand, the MoA duration was significantly negatively related with the Social ($r = -0.1878$) ($P = 0.01$),

**Table 1** MSCS scores, in patients with MoA and controls

|  | MoA (N = 185) | Controls (N = 203) | P-value |
|---|---|---|---|
| Social | 65.712 ± 24.791 | 96.073 ± 18.591 | <0.001 |
| Competence | 91.426 ± 18.295 | 90.971 ± 19.011 | 0.811 |
| Affect | 76.049 ± 11.914 | 98.856 ± 12.087 | <0.001 |
| Academic | 91.094 ± 11.381 | 93.014 ± 11.948 | 0.107 |
| Family | 71.643 ± 12.426 | 99.815 ± 13.041 | <0.001 |
| Physical | 67.931 ± 21.653 | 92.057 ± 19.762 | <0.001 |
| Global score | 68.629 ± 23.016 | 94.182 ± 16.849 | <0.001 |

**Notes:** The table shows the comparison of mean distribution in specific domains and in the global score of the MSCS, between subjects with MoA and typically developing subjects (controls). The t-test was applied. P-value ≤0.05 was considered statistically significant.
**Abbreviations:** MoA, migraine without aura; MSCS, Multidimensional Self-Concept Scale.

Competence ($r = -0.2270$) ($P = 0.002$), Physical ($r = -0.1976$) ($P = 0.007$), and total ($r = -0.1903$) ($P = 0.009$) scores of the MSCS.

## Discussion

The study of the psychological characteristics of children with migraines dates back half a century. As reported in a recent meta-analysis by Balottin et al,[46] in 1955, Vahlquist[47] identified neurovegetative instability, ambition and perfectionism, and anxiety in these children, and Bille[48] described children affected by migraine headache as more anxious, sensitive, deliberate, cautious, fearful, vulnerable to frustration, tidy, and less physically enduring than control group children. Moreover, a few years later, Koch and Melchior[49] found signs of nervousness, mental instability, and immaturity compared with healthy controls, in children affected by migraine, suggesting "a decreased resistance to psychological stress and conflict situations, rather than overt psychological disorder, or endogenous disease." Maratos and Wilkinson,[50] more than a decade later, found higher rates of anxiety and depression associated with "disturbed parental relationships" in children with migraine; an emotional upset was the most frequently reported headache trigger in this study. Subsequently, Guidetti et al[51] identified the presence of feelings of exclusion from the family group and repressed hostility toward important figures, in children with migraine, while Lanzi et al[52,53] observed a neurotic, borderline personality organization or "white relation" in juvenile migraine- and chronic tension-type-headache sufferers. Cahill and Cannon,[54] in a population-based study, pinpointed that "migraine should be a headache subtype of particular interest for psychiatrists" given the significant association between stress, personality traits, psychiatric disorders, and migraine.

On the other hand, to the best our knowledge, this study was the first to investigate, in children affected by MoA, the self-concept that could impact QoL.

Alternatively, a preponderance of studies on the QoL of children with migraine have emphasized assessment of psychological difficulties, such as depression and anxiety,[55–60] that could also be related to low self-concept,[61] such as was reported in our sample (MSCS total score $P < 0.001$). In addition, we should also consider that psychological factors and/or personality traits may impact QoL, considering that anxiety levels could tend to be higher in children with migraine than in controls.[62]

Given the unpredictable nature and intensity of migraine pain and its associated symptoms, it is not surprising that there is concern about the impact of migraine on the day-to-day lives of affected children, as shown in our sample in the Social ($P < 0.001$) and Physical ($P < 0.001$) self-concept domains, particularly.

Conversely, the disruption in school attendance and in academic performances has been one of the most consistently noted consequences of chronic headache;[63] however, attention to migraine-associated disability has expanded to include participation in leisure activities with peers.[64] However, our results failed to show significant differences in the Academic domain of self-esteem compared with the controls ($91.094 \pm 11.381$ versus $93.014 \pm 11.948$) ($P = 0.107$), probably because of the enhanced verbal activity for subjects affected by MoA, as reported in a previous study.[13] Subsequently in this light we could suggest that improving the school integration could support the high self-concept level in the Academic domain.

On the other hand, recently, behavioral disorders have been reported as more common in children who experienced headache than in controls.[65]

The QoL of children with headaches is significantly affected by their health condition, and the impact of headaches on QoL is similar to that found for other chronic illness conditions, with impairments in school and emotional functioning being the most prominent.[66]

At the same time, the frequent school absenteeism may be interpreted also as a significant stressor affecting academic performance, social interactions with peers, and in general, level of self-esteem, thus also aggravating and worsening pain perception.[67]

Moreover, the school absenteeism relevance is not only a consideration in lack of learning, but also in emotional and social development.[68] In this light, the frequency and intensity of migraine attacks may be held responsible for the reduction in the Social ($65.712 \pm 24.791$ versus $96.073 \pm 18.591$) ($P < 0.001$) and Physical ($67.931 \pm 21.653$ versus $92.057 \pm 19.762$) ($P < 0.001$) domains and in the total self-esteem levels ($68.629 \pm 23.016$ versus $94.182 \pm 16.849$) ($P < 0.001$), probably due to an awareness of being different from other children and due to a perception of illness.

Although knowledge about QoL and function as well as the self-esteem of children affected by primary headache is still lacking and inconclusive and while to date, the few studies in this field have provided information on only a restricted number of domains, in fact, the impact of headache in children and adolescents may be considered as extending all the aspects of life.[12]

In this perspective, as suggested by Ballottin et al, childhood migraine should be understood and managed as a

neuropsychiatric disorder, with an important role played by both biological and psychological factors.[69]

In conclusion, our study is the first to identify differences in self-concept levels, in children affected by MoA compared with controls, suggesting the need for evaluation of self-concept for better psychological pediatric management of children with migraine.

## Disclosure

The authors report no conflicts of interest in his work.

## References

1. Headache Classification Subcommittee of the International Headache Society. *The International Classification of Headache Disorders*, 2nd ed. *Cephalalgia*. 2004;24 Suppl 1:9–160.
2. Stovner LJ, Andree C, Eurolight Steering Committee Prevalence of headache in Europe: a review for the Eurolight project. *J Headache Pain* 2010;11:289–299.
3. Freitag FG. The cycle of migraine: patients' quality of life during and between migraine attacks. *Clin Ther*. 2007;29(5):939–949.
4. Lipton RB, Liberman JN, Kolodner KB, Bigal ME, Dowson A, Stewart WF. Migraine headache disability and health-related quality-of-life: a population-based case-control study from England. *Cephalalgia*. 2003;23(6):441–450.
5. Stovner Lj, Hagen K, Jensen R, et al. The global burden of headache: a documentation of headache prevalence and disability worldwide. *Cephalalgia*. 2007;27(3):193–210.
6. Bussone G, Usai S, Grazzi L, Rigamonti A, Solari A, D'Amico D. Disability and quality of life in different primary headaches: results from Italian studies. *Neurol Sci*. 2004;25 Suppl 3:S105–S107.
7. Leonardi M, Steiner TJ, Scher AT, Lipton RB. The global burden of migraine: measuring disability in headache disorders with WHO's Classification of Functioning, Disability and Health (ICF). *J Headache Pain*. 2005;6(6):429–440.
8. Vos T, Flaxman AD, Naghavi M, et al. Years lived with disability (YLDs) for 1160sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012;380(9859):2163–2196.
9. Leonardi M, Raggi A, Bussone G, D'Amico D. Health-related quality of life, disability and severity of disease in patients with migraine attending to a specialty headache center. *Headache*. 2010;50(10):1576–1586.
10. Lipton RB, Bigal ME, Kolodner K, Stewart WF, Liberman JN, Steiner TJ. The family impact of migraine: population-based studies in the USA and UK. *Cephalalgia*. 2003;23(6):429–440.
11. Esposito M, Gallai B, Parisi L, et al. Maternal stress and childhood migraine: a new perspective on management. *Neuropsychiatr Dis Treat*. 2013;9:351–355.
12. Kernick D, Campbell J. Measuring the impact of headache in children: a critical review of the literature. *Cephalalgia*. 2009;29(1):3–16.
13. Esposito M, Pascotto A, Gallai B, et al. Can headache impair intellectual abilities in children? An observational study. *Neuropsychiatr Dis Treat*. 2012;8:509–513.
14. Esposito M, Verrotti A, Gimigliano F, et al. Motor coordination impairment and migraine in children: a new comorbidity? *Eur J Pediatr*. 2012;171(11):1599–1604.
15. 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;6(4):268–270.
16. Vendrame M, Kaleyias J, Valencia I, Legido A, Kothare SV. Polysomnographic findings in children with headaches. *Pediatr Neurol*. 2008;39(1):6–11.

17. Carotenuto M, Esposito M, Precenzano F, Castaldo L, Roccella M. Cosleeping in childhood migraine. *Minerva Pediatr*. 2011;63(2):105–109.
18. Carotenuto M, Esposito M, Pascotto A. Migraine and enuresis in children: An unusual correlation? *Med Hypotheses*. 2010;75(1):120–122.
19. Esposito M, Gallai B, Parisi L, et al. Primary nocturnal enuresis as a risk factor for sleep disorders: an observational questionnaire-based multicenter study. *Neuropsychiatr Dis Treat*. 2013;9:437–443.
20. Esposito M, Roccella M, Parisi L, Gallai B, Carotenuto M. Hypersomnia in children affected by migraine without aura: a questionnaire-based case-control study. *Neuropsychiatr Dis Treat*. 2013;9:289–294.
21. Arruda MA, Guidetti V, Galli F, Albuquerque RC, Bigal ME. Migraine, tension-type headache, and attention-deficit/hyperactivity disorder in childhood: a population-based study. *Postgrad Med*. 2010;122(5):18–26.
22. Guidetti V, Galli F, Sheftell F. Headache attributed to psychiatric disorders. *Handb Clin Neurol*. 2010;97:657–662.
23. Galli F, Canzano L, Scalisi TG, Guidetti V. Psychiatric disorders and headache familial recurrence: a study on 200 children and their parents. *J Headache Pain*. 2009;10(3):187–197.
24. Bruni O, Russo PM, Ferri R, Novelli L, Galli F, Guidetti V. Relationships between headache and sleep in a non-clinical population of children and adolescents. *Sleep Med*. 2008;9(5):542–548.
25. Galli F, D'Antuono G, Tarantino S, et al. Headache and recurrent abdominal pain: a controlled study by the means of the Child Behaviour Checklist (CBCL). *Cephalalgia*. 2007;27(3):211–219.
26. Guidetti V, Galli F. Psychiatric comorbidity in chronic daily headache: pathophysiology, etiology, and diagnosis. *Curr Pain Headache Rep*. 2002;6(6):492–497.
27. Guidetti V, Galli F, Cerutti R, Fortugno S. "From 0 to 18": what happens to the child and his headache? *Funct Neurol*. 2000;15 Suppl 3:122–129.
28. Guidetti V, Galli F, Fabrizi P, et al. Headache and psychiatric comorbidity: clinical aspects and outcome in an 8-year follow-up study. *Cephalalgia*. 1998;18(7):455–462.
29. Verrotti A, Agostinelli S, D'Egidio C, et al. Impact of a weight loss program on migraine in obese adolescents. *Eur J Neurol*. 2013;20(2):394–397.
30. 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;33(6):1365–1368.
31. Esposito M, Carotenuto M. Ginkgolide B complex efficacy for brief prophylaxis of migraine in school-aged children: an open-label study. *Neurol Sci*. 2011;32(1):79–81.
32. Carotenuto M, Esposito M. Nutraceuticals safety and efficacy in migraine without aura in a population of children affected by neurofibromatosis type I. *Neurol Sci*. Epub March 27, 2013. DOI 10.1007/s10072-013-1403-z.
33. Bruni O, Galli F, Guidetti V. Sleep hygiene and migraine in children and adolescents. *Cephalalgia*. 1999;19 Suppl 25:57–59.
34. Carotenuto M, Gallai B, Parisi L, Roccella M, Esposito M. Acupressure therapy for insomnia in adolescents: a polysomnographic study. *Neuropsychiatr Dis Treat*. 2013;9:157–162.
35. Chopra R, Robert T, Watson DB. Non-pharmacological and pharmacological prevention of episodic migraine and chronic daily headache. *W V Med J*. 2012;108(3):88–91.
36. Kröner-Herwig B, Gassmann J. Headache disorders in children and adolescents: their association with psychological, behavioral, and socio-environmental factors. *Headache*. 2012;52(9):1387–1401.
37. Sieberg CB, Huguet A, von Baeyer CL, Seshia S. Psychological interventions for headache in children and adolescents. *Can J Neurol Sci*. 2012;39(1):26–34.
38. Tarantino S, De Ranieri C, Dionisi C, et al. Clinical features, anger management and anxiety: a possible correlation in migraine children. *J Headache Pain*. 2013;14(1):39.
39. Markus H. Self-schemata and processing information about the self. *J Personality and Social Psychology*. 1977;35(2):63–78.

40. Kesting ML, Lincoln TM. The relevance of self-esteem and self-schemas to persecutory delusions: A systematic review. *Compr Psychiatry*. Epub May 16, 2013.

41. Esposito M, Carotenuto M. Intellectual disabilities and power spectra analysis during sleep: a new perspective on borderline intellectual functioning. *J Intellect Disabil Res*. March 21, 2013. DOI 10.1111/jir.12036.

42. Esposito M, Carotenuto M. Borderline intellectual functioning and sleep: the role of cyclic alternating pattern. *Neurosci Lett*. 2010;485(2):89–93.

43. World Medical Association. *WMA Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects*, 2008. New York, NY: World Medical Association; 2008. Available from: http://www.wma.net/en/30publications/10policies/b3/. Accessed April 25, 2013.

44. Bracken BA. Multidimensional Self Concept Scale: Examiner's Manual. Austin, TX: Pro-ed; 1992.

45. Bracken BA. *TMA: Test Multidimensionale dell'Autostima*. Trento: Edizioni Erickson; 1993. Italian.

46. Balottin U, Poli PF, Termine C, Molteni S, Galli F. Psychopathological symptoms in child and adolescent migraine and tension-type headache: a meta-analysis. *Cephalalgia*. 2013;33(2):112–122.

47. Vahlquist B. Migraine in children. *Int Arch Allergy Appl Immunol*. 1955;7:348–355.

48. Bille BS. Migraine in school children. A study of the incidence and short-term prognosis, and a clinical, psychological and electroencephalographic comparison between children with migraine and matched controls. *Acta Paediatr Suppl*. 1962;136:1–151.

49. Koch C, Melchior JC. Headache in childhood. A five year material from a pediatric university clinic. *Dan Med Bull*. 1969;16(4):109–114.

50. Maratos J, Wilkinson M. Migraine in children: A medical and psychiatric study. *Cephalalgia*. 1982;2(4):179–187.

51. Guidetti V, Mazzei G, Ottaviano S, Pagliarini M, Paolella A, Seri S. The utilization of the Rorschach test in a case-controlled study. *Cephalalgia*. 1986;6(2):87–93.

52. Lanzi G, Balottin U, Pitillo G, Zambrino CA. Personality characteristics in juvenile tension headache and migraine. *Funct Neurol*. 1994;9(2):83–88.

53. Lanzi G, Balottin U, Gamba N, Fazzi E. Psychological aspects of migraine in childhood. *Cephalalgia*. 1983;3 Suppl 1:218–220.

54. Cahill CM, Cannon M. The longitudinal relationship between comorbid migraine and psychiatric disorder. *Cephalalgia*. 2005;25(11):1099–1100.

55. Holden EW, Gladstein J, Trulsen M, Wall B. Chronic daily headache in children and adolescents. *Headache*. 1994;34(9):508–514.

56. Andrasik F, Kabela E, Quinn S, Attanasio V, Blanchard EB, Rosenblum EL. Psychological functioning of children who have recurrent migraine. *Pain*. 1988;34(1):43–52.

57. Carlsson J, Larsson B, Mark A. Psychosocial functioning in school-children with recurrent headaches. *Headache*. 1996;36(2):77–82.

58. Martin-Herz SP, Smith MS, McMahon RJ. Psychosocial factors associated with headache in junior high school students. *J Pediatr Psychol*. 1999;24(1):13–23.

59. Just U, Oelkers R, Bender S, et al. Emotional and behavioural problems in children and adolescents with primary headache. *Cephalalgia*. 2003;23(3):206–213.

60. Anttila P, Sourander A, Metsähonkala L, Aromaa M, Helenius H, Sillanpää M. Psychiatric symptoms in children with primary headache. *J Am Acad Child Adolesc Psychiatry*. 2004;43(4):412–419.

61. Sowislo JF, Orth U. Does low self-esteem predict depression and anxiety? A meta-analysis of longitudinal studies. *Psychol Bull*. 2013;139(1):213–240.

62. D'Andrea G, Nertempi P, Ferro Milone F, Joseph R, Cananzi AR. Personality and memory in childhood migraine. *Cephalalgia*. 1989;9(1):25–28.

63. Abu-Arefeh I, Russell G. Prevalence of headache and migraine in schoolchildren. *BMJ*. 1994;309(6957):765–769.

64. Hershey AD, Powers SW, Vockell AL, LeCates S, Kabbouche MA, Maynard MK. PedMIDAS: development of a questionnaire to assess disability of migraines in children. *Neurology*. 2001;57(11):2034–2039.

65. Pavone P, Rizzo R, Conti I, et al. Primary headaches in children: clinical findings on the association with other conditions. *Int J Immunopathol Pharmacol*. 2012;25(4):1083–1091.

66. Powers SW, Patton SR, Hommel KA, Hershey AD. Quality of life in childhood migraines: clinical impact and comparison to other chronic illnesses. *Pediatrics*. 2003;112(1 Pt 1):e1–e5.

67. Sullivan MJ, Thorn B, Haythornthwaite JA, et al. Theoretical perspectives on the relation between catastrophizing and pain. *Clin J Pain*. 2001;17(1):52–64.

68. Akyol A, Kiylioglu N, Aydin I, et al. Epidemiology and clinical characteristics of migraine among school children in the Menderes region. *Cephalalgia*. 2007;27(7):781–787.

69. Balottin U, Chiappedi M, Rossi M, Termine C, Nappi G. Childhood and adolescent migraine: a neuropsychiatric disorder? *Med Hypotheses*. 2011;76(6):778–781.