

EMOTIONAL INTELLIGENCE AND OBSTRUCTIVE SLEEP APNEA SYNDROME IN CHILDREN: PRELIMINARY CASE-CONTROL STUDY

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ABSTRACT

Introduction: Obstructive sleep apnea syndrome (OSAS) affects up to 4% of pediatric population, with many co-morbidities in the medium-long term. Functional alterations in prefrontal cortex (PFC) may explain why OSAS impacts aspects such as: executive functions, memory, motor control, attention, visual-spatial skills, learning and mood regulation. Emotional intelligence (EI) is a complex neuropsychological function that could be impaired in many clinical conditions. Aim of the study is to evaluate the difference in emotional intelligence skills among children with OSAS and healthy subjects

Materials and methods: 29 children (16 males) mean age 9.5 ± 1.54 years, affected by OSAS were compared with 60 typical developing children similar for gender ($p = 0,871$), age ($p = 0,934$) and socio-economic status ($p = 0.714$). Bar-On emotional quotient inventory, youth version (EQ-i: YV) was used in order to assess the Emotional Quotient.

Results: Apnea/hypopnea index (AHI) results to be 8.76 ± 3.45 with medium desaturation index (ODI) amounting to $2:52 \pm 21.5$, average saturation 92.7 ± 4.8 %, average desaturation 4.9 %.

OSAS children have significant differences in Interpersonal scales (84.95 ± 07.03 vs. 99.61 ± 8.96 ; $p < 0.001$), Adaptability ($7:36 \pm 79.61$ vs. 101.32 ± 9.4 ; $p < 0.001$), Stress Management (72.48 ± 8.14 vs. 98.44 ± 5.19 , $p < 0.001$), QE Total (81.28 ± 11.03 vs. 102.14 ± 9.62 ; $p < 0.001$). Pearson correlation analysis shows an inverse relationship between QE total and ODI ($p < 0.01$).

Conclusion: Our findings tend to highlight the role of intermittent hypoxia in OSAS effects genesis, involving also aspects different from physical impairments.

Keywords: emotional intelligence, OSAS, sleep apnea, Bar-On emotional quotient inventory; EQ-i: YV.

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Introduction

Obstructive sleep apnea syndrome (OSAS) affects up to 4% of the pediatric population, particularly between 5-7 years of age and there are many co-morbidities in the medium and long term.

Functional alterations in prefrontal cortex (PFC) may explain why OSAS, especially during childhood, impacts aspects such as: executive functions, memory, motor control, attention, visual-spatial skills, learning and mood regulation⁽¹⁻⁷⁾.

Several studies have focused on alterations about executive functioning in children with OSA, with a putative specific relationship with the degree of respiratory troubles, supporting the role of intermittent hypoxia impact the fronto-prefrontal regions⁽⁶⁻¹²⁾.

The emotional intelligence (EI) may be defined as “the ability to monitor one’s own and others’ feelings and use this information to guide one’s thoughts and actions. Therefore EI is a complex neuropsychological function that could be

impaired in many clinical conditions.

The aim of the study is to evaluate the difference in emotional intelligence skills among children with OSAS and healthy subjects

Materials and methods

29 children (16 males, 13 females) mean age 9.5 ± 1.54 years, affected by OSAS diagnosed with polysomnography examination (PSG) in accordance with international criteria, were compared with 60 typical developing (TD) children according to gender ($p = 0.871$), age ($p = 0.934$) and socio-economic status ($p = 0.714$).

Exclusion criteria were the following: overweight ($z\text{-BMI} > 85$ pc) and obesity ($z\text{-BMI} > 95$ pc), cognitive disability ($IQ < 70$), neurological disorders (ie headaches, epilepsy), chromosomal syndromes (eg. Down, Prader-Willi, Crouzon, Pierre-Robin, trisomy 18), psychiatric illness (ie. mood disorders, anxiety disorders, psychosis) and specific neuropsychological disorders⁽¹³⁻³⁸⁾.

Polysomnographic (PSG) Data

After reviewing and analyzing PSG data collected from inpatients children between January and June 2016 to establish the presence of OSA in the experimental group, OSA severity was determined according to the current international guidelines: mild OSA was defined by an obstructive apnea-hypopnea index (o AHI) of 1 to <5 events per hour; moderate OSA was defined as was defined as ≥ 5 to <10 events/hour, and severe OSA ≥ 10 events/hour

Bar-On emotional quotient inventory, youth version (EQ-i: YV).

This inventory is a self-report measure of emotionally and socially intelligent behavior, which provides an estimate of one's underlying emotional and social intelligence. It has 60 items which are distributed over six sub-scales (Intrapersonal Relationships, Interpersonal Relationships, Stress Management, Adaptability, General Mood and Positive Impression) and also provides a Total EQ score. Validation of the inventory on North American samples suggests that the Bar-On Emotional Quotient Inventory: Youth Version has excellent psychometric properties and identifies core features of emotional intelligence in children. A standard score in the range of 90-110 indicates effective emotional and social functioning.

A score greater than 110 suggests the presence of enhanced emotional and social skills, while a score of less than 90 suggests that emphasis should be placed on enriching skills in that area. Responses were rated by the psychology post-graduate student on a 4-point scale ranging from 1 ('very seldom true of me') to 4 ('very often true of me'). For measuring emotional intelligence has been used the Italian version of EQ-i: YV test in order to assess the skills related to themselves and the others understanding, adapting to the changes demanded by the environment and the management of emotions.

Statistical analysis

Chi-square and t-test were performed when appropriated, in order to compare the two population (OSAS and TDC) for age, gender, EQ-i:YV scores. p values ≤ 0.05 were considered as statistical significant.

Results

The apnea / hypopnea index (AHI) results to be 8.76 ± 3.45 with medium desaturation index (ODI) amounting to $2:52 \pm 21.5$, average saturation 92.7 ± 4.8 %, average desaturation 4.9 %.

	OSAS (N=29)	TDC (N=64)	p
Interpersonal	84.95±7.03	99.61±8.96	<0.001
Intrapersonal	92.19±8.96	94.17±9.23	0.336
Adaptability	79.61±7.36	101.32±4.09	<0.001
Stress management	72.48±8.14	98.44±5.19	<0.001
General Mood	91.06±9.18	92.41±10.32	0.547
QE Total	81.28±11.03	102.14±9.62	<0.001
Positive Impression	89.47±5.12	91.04±6.07	0.229
Inconsistency Index	<5	<5	-

Table 1: shows the comparison fir means and standard deviation (\pm) between the two population of children affected by obstructive sleep apnea syndrome (OSAS) and typical developing children (TDC) for EQ-i:YV scores.

Chi-square and t-test were performed when appropriated. p values ≤ 0.05 were considered as statistical significant.

OSAS children have significant differences in Interpersonal scales (84.95 ± 07.03 vs. 99.61 ± 8.96 ; $p < 0.001$), Adaptability ($7:36 \pm 79.61$ vs. 101.32 ± 9.4 ; $p < 0.001$), Stress Management (72.48

± 8.14 vs. 98.44 ± 5.19 , $p < 0.001$), QE Total (81.28 ± 11.03 vs. 102.14 ± 9.62 ; $p < 0.001$).

The Pearson correlation analysis shows an inverse relationship between QE total and ODI index ($p < 0.01$) (table 1).

Discussion

OSA represents a public health problem affecting approximately 1% to 6% of all children, up to 59% of obese children, and 2% to 24% of adults, and 70% of bariatric surgery patients. The incidence increases with age; and the disorder is responsible for billions of dollars of direct and indirect health care costs in the form of motor vehicle crashes; medical conditions, including cardiovascular disease, metabolic syndrome, diabetes, and cerebrovascular disease; as well as perioperative morbidity and mortality. The presence OSAS also has implications for job and school performance and has been associated with potentially life-long cognitive impairment as well as sudden death.

OSAS has numerous comorbidities in children which can affect various aspects of life, not only for the subsequent disability, but especially for those still not well identified⁽³⁹⁻⁵⁰⁾.

Moreover, OSAS contributes to cognitive deficits as supported by research showing impaired learning and behavioural problems in juvenile rats exposed to intermittent hypoxia during sleep, as well as by imaging studies showing cerebral neuronal injury in children with OSAS. In this light, several areas of the PFC (e.g., the dorsolateral prefrontal cortex [DLPFC] and ventrolateral prefrontal cortex [VLPFC]) play an important role in the integration of emotion and cognition. In fact, MRI studies have revealed abnormalities in the DLPFC, VLPFC, and orbitofrontal cortex (OFC) in patients with psychiatric conditions. In addition to the PFC, dispositional envy may also recruit the activation of regions related to the perception of emotions or intentions, such as the temporal gyrus (θ). Our findings tend to highlight the role of intermittent hypoxia in OSAS effects genesis, involving also aspects different from physical impairments., although further studies are necessary⁽³⁹⁻⁵⁰⁾.

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