Sleep quality and communication aspects in children

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A B S T R A C T

Objectives: To correlate quality of life of children in terms of sleep, with their oral language skills, auditory processing and orofacial myofunctional aspects.

Methods: Nineteen children (12 males and seven females, in the mean age 9.26) undergoing otorhinolaryngological and speech evaluations participated in this study. The OSA-18 questionnaire was applied, followed by verbal and nonverbal sequential memory tests, dichotic digit test, nonverbal dichotic test and Sustained Auditory Attention Ability Test, related to auditory processing. The Phonological Awareness Profile test, Rapid Automatized Naming and Phonological Working Memory were used for assessment of the phonological processing. Language was assessed by the ABFW Child Language Test, analyzing the phonological and lexical levels. Orofacial myofunctional aspects were evaluated through the MBGR Protocol. Statistical tests used: the Mann-Whitney Test, Fisher’s exact test and Spearman Correlation.

Results: Relating the performance of children in all evaluations to the results obtained in the OSA-18, there was a statistically significant correlation in the phonological working memory for backward digits (p = 0.04); as well as in the breathing item (p = 0.03), posture of the mandible (p = 0.03) and mobility of lips (p = 0.04).

Conclusion: A correlation was seen between the sleep quality of life and the skills related to the phonological processing, specifically in the phonological working memory in backward digits, and related to orofacial myofunctional aspects.

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1. Introduction

The nasal respiratory mode contributes to the adequate craniofacial and global development of the child, in the stomatognathic functions and the body posture [1], and has a suggestive relationship with a quality of sleep, since children who present oronasal or oral breathing may be more susceptible to snoring and/or Obstructive Sleep Apnea [2], altered school achievement, bruxism, enuresis and nocturnal agitation [3].

Disturbances of respiratory function in children are still related to impairment of attention [4], visual perception, memory [5] and phonological processing [6,7]. In addition to psycholinguistic abilities, studies suggest a direct correlation with the Oral Language, at the level of expressive vocabulary [6–9], receptive vocabulary [10], phonological level [8], verbal fluency [11] and Global Expressive Language [6,7,12].

It was observed that oral breathing and Obstructive Sleep Apnea may also be related to altered auditory processing in children, specifically in the abilities of temporal ordering and background figure for verbal sounds [13].

In cases which the respiratory mode affects the quality of sleep, owing to deprivation of an adequate sleep, compromising of health and body functioning is possible. For the measurement of sleep quality, the Obstructive sleep apnea–18-item questionnaire (OSA-18) which assists in the clinical management of these cases, by measuring sleep quality of life, was elaborated [14–18].
Due to the findings in the literature associating the impairment of orofacial myofunctional aspects, auditory processing and verbal skills with sleep disorders, we sought to investigate speech-language disorders that may be associated with poor sleep quality in children.

Thus, the present research aimed at correlating children’s sleep quality of life with oral language skills, auditory processing and orofacial myofunctional aspects.

2. Methods

The study was approved by the Research Ethics Committee of the institution involved (number CAAE 13033313.3.0000.5417), and only the children whose parents/guardians signed the informed consent, were submitted to the proposed procedures.

2.1. Sample

The study included 19 children, 12 males and 7 females, aged 7 to 12, the mean age being 9.26 years (dp 1.85). The children were evaluated by an otorhinolaryngologist, so as to identify possible conductive factors in the peripheral auditory pathway (a prerequisite for conventional audiology and auditory processing assessment). This professional also performed rhinoscopy and oroscopy, investigating structural characteristics that could interfere with the respiratory function.

Inclusion criteria: age between seven and 12 years; no alteration in the medical evaluation for the performance of the proposed tests; no neurological changes; auditory thresholds of frequencies 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz within normality patterns and type A tympanometric curve.

Exclusion criteria: children who did not complete all the evaluations performed by the Otorhinolaryngologist and Speech-Language Therapist (in the fields of Orofacial Motricity, Language and Audiology).

The speech-language evaluation was performed in two visits with a total duration of 3 h, in each child, not exceeding the maximum period of two weeks to complete the assessments.

2.2. Procedures

2.2.1. Sleep quality of life

The Brazilian Portuguese version of questionnaire OSA-18 [19] was applied to the caregivers/responsible for the children, aiming at quantifying the quality of sleep. In order to do this, five domains were evaluated: sleep disturbance (four items with scores varying from 4 to 28), physical symptoms (four items with scores ranging from 4 to 28), emotional symptoms (three items with scores ranging from 3 to 21), daytime function (three items with scores varying from 3 to 21) and - caregiver concerns (four items with scores ranging from 4 to 28). The total score of OSA-18, therefore, ranged from 18 to 126 [15], and the higher the scores, the worse the quality of life of sleep.

2.2.2. Auditory processing assessment

Audiolingual evaluation (Pure-Tone Threshold Audiometry, Speech audiometry and Immittance) was performed prior to the auditory processing evaluation, and all the children presented tonal thresholds equal or inferior to 15 dBNHL between frequencies 250 Hz and 8 kHz, Type A tympanometric curve, and Speech audiometry compatible with Pure-Tone Threshold Audiometry, bilaterally.

The following instruments were used, in order to evaluate the auditory abilities: Memory test for verbal and non-verbal sounds in sequence, to verify the ability of temporal ordering; Dichotic Digits Test for background figure ability for verbal sounds; Nonverbal Dichotic Test to verify the background figure ability for nonverbal sounds [20], and the Sustained Auditory Attention Ability Test [21], to assess the ability of sustained auditory attention.

2.2.3. Evaluation of phonological processing

The Phonological Awareness Profile test [22] was applied aiming at evaluating the phonological awareness performance, through the phonological abilities that it covers (analysis, addition, segmentation, substitution, rhyme, sequential rhyme, syllabic reversal and articulatory image). The Rapid Automatized Naming (RAN) consists of a set of tests that allow to establish parameters of the speed at which the lexicon is accessed in different semantic groups: colors, letters, digits and objects [23]. Thus, the children were asked to name the figures as quickly as they could. The evaluator used a timer to calculate the time in which the child named each semantic category.

The Phonological Work Memory aimed at assessing the processing and storage of information, nonwords and digits, in the short term [24]. The evaluator emitted sequences of nonwords and digits, to be repeated by the volunteer. Two chances were given for each sequence to be properly repeated.

It is emphasized that the three evaluations above are related to phonological processing, indicating the performance for the execution of complex cognitive activities such as comprehension, learning and written language [25].

2.2.4. Language evaluation - phonological and lexical level

Phonology and vocabulary were evaluated with the proofs of words and lexical competence (categories: clothing, animals, food, transportation, furniture and utensils, professions, places, shapes and colors, toys and musical instruments) of the ABFW Children’s Language Test [26].

2.2.5. Orofacial myofunctional evaluation and anthropometric measurements

The children were submitted to the following tests of the MBGR orofacial myofunctional MBGR exam [27]: aspects of the teeth, habitual posture analysis, aspect of tongue and mobility of lips, tongue, cheeks and soft palate; toxicity of lips, tongue and cheeks, assigning the scores of 0 for normality up to 3 points (worst condition), varying for each item. Regarding the orofacial functions, the breathing was evaluated, as to the type, mode and possibility of nasal use, and speech, also being attributed scores from the analysis of saliva aspects, mouth opening, tongue position, labial and mandibular movement, resonance, articulatory precision, velocity and pneumo-phono-articulatory coordination.

The anthropometric measurements of the children were also recorded: weight, height, and cervical circumference. The body mass index (BMI), which is determined by the ratio of mass (in kilograms) of the individuals by the square of their height (in meters), was calculated as well.

2.3. Analysis of results

The results of the evaluations were analyzed using the Mann-Whitney test for the quantitative variables (percentages and scores). Fisher’s exact test was used for comparison between qualitative variables. Spearman correlation was used to compare all variables with the results of the OSA-18 sleep quality questionnaire.

Values from –1 to 1, where the value suggests the strength of the relationship between the variables and the signal indicates the positive or negative direction of their relationship, were used in order to verify the correlation coefficient. Values ranging from 0.10 to 0.30 show a weak correlation between the variables [28];
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