Clinical Validation of The Portuguese Version of the Children Sleep Habits Questionnaire (CSHQ-PT) in Children with Sleep Disorder and ADHD

Validação Clínica da Versão Portuguesa do Questionário de Hábitos de Sono das Crianças (CSHQ-PT) em Crianças com Perturbações do Sono e PHDA

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ABSTRACT

Introduction: The Portuguese version of the Children's Sleep Habits Questionnaire showed adequate psychometric properties in a community sample but the American cut-off seemed inadequate. This study aimed to validate this questionnaire in clinical populations of children with sleep disorders and with attention deficit/ hyperactivity disorder.

Material and Methods: The study sample included 148 Portuguese children aged 2 to 10 years old that where divided in 3 groups: 1. Clinical group with sleep disorders (behavioral insomnias, parasomnias or sleep-related breathing disorders); 2. Clinical group with attention deficit/ hyperactivity disorder; 3. Control group. The sleep habits and sleep problems were evaluated using the Children's Sleep Habits Questionnaire. Sleep-related disorders were confirmed by polysomnography.

Results: The questionnaire's internal consistency (Cronbach *α*) in the clinical sample (sleep disorders and attention deficit/ hyperactivity disorder) was 0.75 and ranged from 0.55 to 0.85 for the subscales. Children with sleep disorders and attention deficit/ hyperactivity disorder had a higher sleep disturbance index (full scale score) compared to the control group. The subscales presented significant differences between the subgroups with different sleep disorders showing discriminative validity. The receiver operating characteristic analysis of the sleep disturbance index comparing the sleep disorder and control sample determined a cut-off of 48 (sensibility 0.83; specificity 0.69).

Discussion: Children with sleep disorders and attention deficit/ hyperactivity disorder evidenced higher Sleep Disturbance Index (full scale score) comparing to the control group. The subscales presented significative differences between the subgroups with different sleep disorders showing discriminative validity

Conclusion: The Portuguese version of the Children's Sleep Habits Questionnaire showed adequate psychometric properties for children with sleep disorders and/or attention deficit/ hyperactivity disorder. The cut-off value 48 is better adjusted for the Portuguese population.

Keywords: Attention Deficit Disorder with Hyperactivity; Child; Portugal; Sleep; Sleep Initiation and Maintenance Disorders; Surveys and Questionnaires

RESUMO

Introdução: A versão Portuguesa do *Children's Sleep Habits Questionnaire* mostrou propriedades psicométricas adequadas numa amostra comunitária mas o ponto de corte americano pareceu desadequado. O objetivo deste estudo foi validar este questionário em populações clínicas de crianças com distúrbios do sono e com perturbação de hiperatividade/ défice de atenção.

Material e Métodos: Participaram no estudo 148 crianças Portuguesas com idades entre os 2 e os 10 anos, divididas em três grupos: 1. Grupo clínico com perturbação do sono (insónia comportamental, parassónias ou perturbação respiratória do sono); 2. Grupo clínico com perturbação de hiperatividade/ défice de atenção; 3. Grupo controlo. Os hábitos e problemas do sono foram avaliados através do *Children's Sleep Habits Questionnaire*. A perturbação respiratória do sono foi confirmada por polissonografia.

Resultados: A coerência interna do questionário (*α* de Cronbach) na amostra clínica (perturbações do sono e perturbação de hiperatividade/ défice de atenção) foi de 0,75 e variou de 0,55 a 0,85 nas subescalas. As crianças com perturbações do sono e com perturbação de hiperatividade/ défice de atenção apresentaram um índice de perturbação do sono mais elevado do que o grupo controlo. As subescalas apresentaram diferenças significativas nos subgrupos de perturbações do sono revelando validade discriminante. A análise *receiver operating characteristic* do índice de perturbação do sono do grupo com perturbação do sono *versus* grupo controlo determinou um ponto de corte de 48.

Discussão: As crianças com perturbações do sono e com perturbação de hiperatividade/ défice de atenção apresentaram um Índice de Perturbação do Sono mais elevado do que o grupo controlo. As subescalas apresentaram diferenças significativas nos subgrupos de perturbações do sono revelando validade discriminante.

Conclusão: A versão Portuguesa do *Children's Sleep Habits Questionnaire* mostrou propriedades psicométricas adequadas em crianças com perturbações do sono e/ou perturbação de hiperatividade/ défice de atenção. O ponto de corte de 48 é mais adequado para a população Portuguesa.

Palavras-chave: Criança; Distúrbios da Iniciação e Manutenção do Sono; Inquéritos e Questionários Sono; Perturbação de Hiperatividade e Défice de Atenção; Portugal

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INTRODUCTION

Sleep is a natural process in humans and these spend around one third of their lifespan sleeping.[1] Approximately 25% of children are affected by sleep disorders at some time in their lives and still these could be underdiagnosed.[2-4] Higher prevalence of sleep disorders when compared to the general population was found in some populations, such as in children with attention deficit – hyperactivity disorder (ADHD).[5] These can have a significant impact on children's cognitive and school performance, on emotional regulation and behaviour, as well as on the risk of accidental falls and obesity.[4,6] Therefore, a screening for sleep disorders is quite relevant in order to allow for an early intervention leading to healthier and happier children with improved learning skills.[7]

Children's Sleep Habits Questionnaire was developed in the United States and was aimed at the assessment of sleep habits and disorders in children and is one of the most widely used worldwide.[3,6,7] The Portuguese version (CSHQ-PT) was validated in a community sample of children aged 2 to 10 and adequate psychometric properties were shown. However, the suggested total CSHQ cut-off score of 41 for the original questionnaire would not seem appropriate for the Portuguese population, as cultural-related behavioural patterns were involved, corresponding to higher average scores in the Portuguese population.[3,4]

This study was aimed at the validity of the CSHQ-PT in a clinical sample of children diagnosed with sleep disorders and in children with ADHD.

MATERIAL AND METHODS

Children aged 2 to 10 were included in our group of patients and were recruited from a private healthcare unit in Lisbon offering private and subsystem health insurance coverage. A first group of patients (sleep disorders clinical group) were recruited: a) from a sleep disorder outpatient clinic, diagnosed in compliance with the International Classification of Sleep Disorders, 3rd edition (ICSD-3) criteria and divided into subgroups of behavioural insomnia, parasomnias and sleep-disordered breathing (SDB), involving a medical examination carried out by an experienced physician;[8] b) from a neurophysiology laboratory, involving children referred for polysomnography, presenting with an apnoea-hypopnoea index (AHI) of one event per hour and above, in line with the original validity study by Owens *et al*.[3] The following were the parameters used for the identification of SDB in children: an apnoea event corresponding to a reduction of at least 90% in the range measured by the thermistor; hypopnoea corresponding to a reduction of at least 30% in the range of the nasal cannula pressure recording and related to ≥ 3% desaturation or followed by awakening; at least one obstructive event of at least two breath cycles' duration; respiratory inductance plethysmography (RIP) for event classification. Patients with suspected SDB underwent a polysomnography following the initial clinical evaluation. Children with parasomnias and AHI ≥ 1 were included in the SDB clinical subgroup, while the remaining patients diagnosed with parasomnias were included in the parasomnias clinical subgroup, presenting with comorbid behavioural insomnia.

A second group of patients diagnosed with ADHD according to the DSM-5 criteria (ADHD group)[9] were recruited from the developmental paediatrics outpatient clinic and recently diagnosed patients (on the second or third consultation) were included, in whom no behavioural or pharmacological treatment with a possible influence on the sleep pattern had still been started, in addition to the absence of chronic roncopathy that would suggest the presence of SDB. The form of presentation of ADHD has been specified (DSM-5).[9]

A control group was recruited from the paediatrics outpatient clinic (routine monitoring of healthy children), while children presenting with a sleep problem according to caregiver's evaluation or previously diagnosed with some condition that could have an influence on the patient's sleep pattern were excluded from the study.

Sleep was assessed by use of the Children's Sleep Habits Questionnaire [*Questionário de Hábitos do Sono das Crianças* (CSHQ-PT)], a previously validated 33-item questionnaire which was completed by parents/caregivers.[3,10] Sleep-related behaviours within the past week or within a recent typical week were assessed by this instrument and responses were measured on a three-point scale: *'Habitualmente'* ('Usually'), when any behaviour took place five to seven times a week; *'Às vezes'* ('Sometimes'), two to four times a week; *'Raramente'* ('Rarely'), once a week or never. A score was assigned to each response and the higher the score the more problematic a behaviour was. The whole set of 33 items was used to obtain the total score or respiratory disturbance index (RDI) and scoring of 8 various subscales of sleep problems: 'Bedtime resistance' (*'Resistência em ir para a cama'*), 'Sleep onset delay'(*'Início do sono'*), 'Sleep duration' (*'Duração do sono'*), 'Sleep Anxiety' (*'Ansiedade associada ao sono'*), 'Night wakings' (*'Despertares noturnos'*), Parasomnias (*'Parassónias'*), 'Sleep-disordered breathing' (*'Perturbação respiratória do sono'*) and 'Daytime sleepiness' (*'Sonolência diurna'*). Therefore, the higher the scores in these subscales the more sleep problems existed. Items on demographic data and on health problems and regular medication were also included. Health problems were inquired with the following question: "Was your child ever diagnosed with some of the following problems by any physician, psychologist or speech therapist?" (*"Algum médico, psicólogo ou terapeuta da fala diagnosticou algum dos seguintes problemas no seu filho?"*) and with different response options: rhinitis, asthma, eczema, epilepsy, ADHD, autism spectrum disorder (ASD) / Asperger syndrome, language disorder with an indication for speech therapy, reading disorder / dyslexia, other / specify __.

The protocol of the study was previously approved by the Ethics Committee and parents/caregivers' informed consent has been obtained. Data statistical analysis was carried out by use of the Statistical Package for the Social Sciences (SPSS), version 23 software.

Differences in demographic characteristics between the clinical groups and the control group, such as the patient's age group or parents/caregivers' education, were examined by use of a frequency analysis with chi-square test. Scores in the CSHQ subscales were compared according to the clinical profile, by use of nonparametric Mann-Whitney U test for two groups, while Kruskal-Wallis test was used for more than two groups. A significance level of 0.05 was considered. The questionnaire's internal consistency was also examined with the use of Cronbach's alpha. Sensitivity and specificity of the questionnaire's cut-off values for sleep disorder screening was shown by the analysis of the receiver operating characteristic (ROC) curves.[11]

RESULTS

A total of 248 questionnaires were sent and 175 were returned (70.9%). From these, 27 were excluded (ten complied with the exclusion criteria, six presented with a polysomnography with AHI < 1/h, eight due to having exceeded the age limit and three due to less than 80% valid responses) and 148 questionnaires were finally considered for analysis.

Subgroups had the following composition: 85 children were included in the sleep disorders clinical group (31 diagnosed with behavioural insomnia, 19 with parasomnias and 35 with SDB), 27 in the ADHD clinical group (16 diagnosed with the combined subtype, 10 with the predominantly inattentive subtype, one with the predominantly hyperactive/impulsive subtype) and 36 patients in the control group. Eight patients in the Parasomnias subgroup (42%) presented with comorbid behavioural insomnia.

A 5.82 years (SD = 2.61) mean age has been found in our group of patients and younger patients were found in the sleep disorders clinical group when compared to the other groups, in addition to statistically significant differences regarding age distribution between the three subgroups of patients ($\chi^2(2) = 29.33$; $p < 0.001$).

A 55% male predominance has been found in the control group (56.4% in the sleep disorders clinical group and 74% in the ADHD clinical group). High education level was predominantly found in parents/caregivers, with significantly different distribution between the three groups ($\chi^2(2) = 9.711$; $p < 0.001$) and with higher education level found in the sleep disorders clinical group. Patients mostly (90.5%) lived within Lisbon and Setubal municipalities.

Scale and subscale internal consistency was assessed by use of Cronbach's alpha (Table 1). A 0.75 alpha value in both clinical groups (sleep disorders and ADHD group) and 0.80 in the whole group of patients has been found by use of the full-scale CSHQ-PT. As regards internal consistency of CSHQ-PT subscales, alpha coefficient ranged between 0.55 and 0.85 in clinical groups and between 0.57 and 0.86 in the whole group of patients.

CSHQ-PT scores were compared by age group (2-3, 4-5 and 6-10 years), as a different age distribution has been found between sleep disorders clinical and control groups (a lower mean age was found in the sleep disorders clinical group). Higher RDI values were found in the sleep disorders clinical group in all age groups, when compared to the other groups. Higher scores have been found in 'Sleep duration', 'Night wakings', 'Parasomnias' and 'Sleep-disordered breathing' subscales in 2-3 age group in the sleep disorders clinical group, while more problems in 'Bedtime resistance', 'Sleep duration', 'Sleep anxiety', 'Night wakings', 'Parasomnias' and 'Sleep-disordered breathing' subscales have been found in the 4-5 and 6-10 age groups in the sleep disorders clinical group. Therefore, no significant differences were found in 'Sleep onset delay' and 'Daytime sleepiness' subscales (Table 2).

Significant differences in total score and in most subscales were found when the scales of the three diagnostic subgroups of the sleep disorders clinical group were compared (Table 3).

Similar results were found between Behavioural insomnia and Parasomnias subgroups, except regarding the Parasomnias´ subscale (MW U = 110.0; $p < 0.01$). A trend towards more problems regarding sleep duration were found in the Behavioural insomnia subgroup, even though no

Table 1 – Internal Consistency (Cronbach's alpha) of the total scale and subscales of the CSHQ –PT

Scale/Subscale	Clinical Group (sleep disorders + ADHD) n = 112	Complete Sample (clinical + control group) n = 148
Total Scale, 33 items (RDI)	0.75	0.80
Subscales:		
1. Bedtime resistance	0.64	0.66
2. Sleep onset delay	N.A*	N.A*
3. Sleep duration	0.81	0.81
4. Sleep anxiety	0.58	0.64
5. Night wakings	0.62	0.66
6. Parasomnias	0.55	0.57
7. Sleep-disordered breathing	0.85	0.86
8. Daytime sleepiness	0.64	0.65

N.A*: not applicable. RDI: Respiratory Disturbance Index

Table 2 – Scores of the total scale and subscales of the CSHQ-PT in the different age groups within the sleep disorders clinical group and control group

CSHQ-PT	2 - 3 Years				4 - 5 Years				6 - 10 Years			
	Sleep Disorders Clinical Group n = 34 M(SD)	Control Group n = 6 M (SD)	Mann-Whitney's U-test U	*p*	Sleep Disorders Clinical Group n = 20 M (SD)	Control Group n = 8 M (SD)	Mann-Whitney's U-test U	*p*	Sleep Disorders Clinical Group n = 31 M (SDP)	Control Group n = 22 M (SD)	Mann-Whitney's U-test U	*p*
Total Scale (RDI)	56.09 (8.74)	47.00 (6.06)	36.5	**0.01**	58.50 (3.98)	44.50(6.36)	6.00	**0.001***	53.13 (6.54)	42.71 (5.12)	66.5	**0.001***
Subscales:												
1. Bedtime resistance	10.59 (2.68)	11.66 (3.38)	74.0	0.32	12.25 (1.39)	8.25(2.05)	16.0	**0.001***	9.53 (2.89)	7.90 (2.18)	212.0	**0.01**
2. Sleep onset delay	1.84 (0.84)	1.83 (0.98)	98.0	0.87	1.81 (0.83)	1.50 (0.75)	65.5	0.42	1.87 (0.90)	1.62 (0.86)	292.0	0.43
3. Sleep duration	5.62 (2.02)	3.83 (1.16)	47.5	**0.04**	5.06 (1.84)	3.25 (0.70)	40.5	**0.03**	5.06 (1.87)	3.66 (0.91)	189.0	**0.001***
4. Sleep anxiety	7.46 (2.34)	6.50 (1.87)	77.5	0.39	8.31(1.81)	5.87 (2.47)	36.0	**0.02**	7.26 (2.30)	4.95 (1.49)	133.5	**0.001***
5. Night wakings	6.09 (1.94)	3.83 (0.98)	36.5	**0.01**	5.68 (1.44)	3.50 (1.06)	19.0	**0.001***	5.13 (1.71)	3.76 (1.22)	174.5	**0.001***
6. Parasomnias	10.78 (2.70)	8.16 (1.16)	38.0	**0.01**	10.81 (1.51)	8.75 (1.75)	30.0	**0.01**	10.46 (2.37)	8.52 (1.20)	151.5	**0.001***
7. Sleep-disordered breathing	5.06 (1.91)	3.00 (0.00)	30.0	**0.04**	5.25 (1.80)	3.62 (1.06)	30.0	**0.01**	4.43 (1.52)	3.04 (0.21)	135.0	**0.001***
8. Daytime sleepiness	13.06 (3.34)	12.50 (3.20)	94.5	0.86	14.18 (2.22)	12.62 (1.92)	38.0	0.05	13.06 (2.69)	11.80 (2.71)	240.5	0.06

*$p < 0.01$; RDI: Respiratory Disturbance Index

statistical significance has been reached (MW U = 225.00, $p = 0.15$). As expected, a higher score in the corresponding subscale has been found in children diagnosed with parasomnias.

Most differences were found in the subgroup of patients with SDB (Table 3) when compared to the two remaining subgroups. As expected, a significantly higher score in the corresponding 'SDB' subscale was found in the SDB subgroup, with lower scores (less problems) in 'Sleep duration', 'Sleep anxiety' and 'Night wakings' subscales.

No statistically significant differences were found between the three groups in 'Bedtime resistance', 'Sleep onset delay' and 'Daytime sleepiness' subscales.

Higher RDI values were found in the ADHD group, when compared to the control group. Higher values in 'Sleep anxiety' and 'Parasomnias' subscales were found in this group (Table 4).

Patients in sleep disorders clinical group and in the control group were considered for the analysis of the ROC and a 0.89 (95% CI 0.830 – 0.949) estimated value has been obtained, corresponding to a good discriminatory power.[11] An RDI cut-off level of ≥48 has been defined as allowing for the identification of patients with sleep disorders, with a 0.83 sensitivity and 0.69 specificity. This cut-off index corresponds to 30.6% of the highest scores within the control group. Considering the 4-10 age group only, the same cut-off index has been found in line with the original validity study[3] with a 0.87 sensitivity and 0.76 specificity. With the application of this cut-off index to the ADHD group, 11 patients (40.7%) are classified as presenting with significant symptoms of sleep disorder.

DISCUSSION

This study aimed at the clinical validity of the CSHQ-PT questionnaire and 148 Portuguese patients aged 2 to 10 were included, divided into three groups: 1. Patients diagnosed with sleep disorder; 2. Patients diagnosed with ADHD; 3. Control group. In line with the American questionnaire validity study, three of the most frequent diagnoses (behavioural insomnia of childhood, parasomnias and sleep-disordered breathing) were included in the sleep disorders clinical group.

A 0.75 Cronbach's alpha value for the internal consistency of the questionnaire has been found regarding the full-scale questionnaire in both clinical groups of patients (sleep disorders and ADHD), above the minimum recommended value (0.70) and slightly below the value found in the group of patients within the original validity study (0.78) and in the community group of patients within the Portuguese version validity study (0.78).[3,10,12] A slightly higher value has been found (0.80) when the entire group of patients (n = 148) was considered. Internal consistency values ranging between 0.44 and 0.83 were obtained in subscales, in line with what was found in the study by Owens *et al.* (0.44-0.83).[3] The lowest internal consistency (0.55) has been found in ´Parasomnias' subscale, in line with other studies.[3,10,13,14] This fact was probably due to the heterogeneous behaviours that are

Table 3 – Scores of the total scale and subscales of the CSHQ-PT in the sleep disorders clinical group

Scale/Subscale	Subgroup 1 Behavioural Insomnia n = 31 M	(SD)	Subgroup 2 Parasomnias n = 19 M	(SD)	Subgroup 3 SDB n = 35 M	(SD)	K-W χ^2	M-W Comparisons
Total scale, 33 items (RDI)	56.23	(7.04)	59.11	(7.05)	52.46	(6.8)	9.68**	1 = 2 ≠ 3*** 1 ≠ 3*
Subscales:								
1. Bedtime resistance	10.86	(2.92)	10.77	(2.88)	10.03	(2.4)	2.99 ns	
2. Sleep onset delay	1.93	(0.86)	2.11	(0.83)	1.60	(0.81)	4.63 ns	
3. Sleep duration	6.23	(1.94)	5.44	(1.88)	4.26	(1.41)	17.53***	1 = 2 ≠ 3* 1 ≠ 3**
4. Sleep anxiety	8.00	(2.19)	7.88	(2.19)	6.93	(2.22)	7.04*	1 = 2 ≠ 3* 1 ≠ 3**
5. Night wakings	6.50	(1.52)	6.11	(1.90)	4.50	(1.35)	22.83***	1 = 2 ≠ 3 1 ≠ 3***
6. Parasomnias	10.50	(2.23)	13.05	(1.89)	9.40	(1.54)	29.14***	1 ≠ 2** ≠ 3*** 1 = 3
7. Sleep-disordered breathing	3.80	(1.18)	4.33	(1.41)	6.23	(1.54)	36.58***	1 = 2 ≠ 3*** 1 ≠ 3***
8. Daytime sleepiness	12.80	(3.01)	13.83	(3.25)	13.46	(2.56)	1.09 ns	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0,001$; ns: non-significant; SDB: sleep-disordered breathing; K-W: Kruskal-Wallis; M-W: Mann-Whitney

Table 4 – Scores of the total scale and subscales of the CSHQ-PT in ADHD clinical group and control group

Scale/Subscale	ADHD Clinical Group n = 27 M	(SD)	Control Group n = 36 M	(SD)	Mann-Whitney's U-test U	*p*
Total Scale, 33 items (RDI)	47.70	(7.41)	43.85	(5.64)	334.5	**0.04**
Subscales:						
1. Bedtime resistance	8.37	(2.38)	8.62	(2.71)	474.5	0.87
2. Sleep onset delay	1.67	(0.78)	1.63	(0.84)	475.5	0.87
3. Sleep duration	4.03	(1.67)	3.60	(0.91)	459.0	0.65
4. Sleep anxiety	6.44	(1.94)	5.42	(1.86)	319.0	**0.01**
5. Night wakings	4.14	(1.53)	3.71	(1.12)	404.0	0.21
6. Parasomnias	9.29	(1.68)	8.51	(1.31)	346.0	**0.04**
7. Sleep-disordered breathing	3.48	(1.01)	3.17	(0.56)	401.5	0.12
8. Daytime sleepiness	13.2	(3.64)	12.1	(2.59)	396.0	0.20

RDI: Respiratory Disturbance Index

included within this scale, which are not necessarily found in combination (nocturnal enuresis, sleep-related bruxism and nightmare disorder, for instance). Therefore, we have reached the conclusion that the CSHQ-PT presents with psychometric properties within the clinical context that are similar to those that were described in the original questionnaire and adequate to the context of research and screening of sleep disorders.

Tendentially higher scores have been found in 'Sleep duration' (insufficient), 'Sleep anxiety' (refusal to sleep independently) and 'Night wakings' (more frequent) subscales in the behavioural insomnia of childhood clinical subgroup (most frequent sleep disorder in children).[15] Higher scores in these subscales have been found when compared to the SDB subgroup, which were not found when compared to the Parasomnias subgroup, with no statistically significant differences. This finding could be explained by the fact that patients in the Parasomnias subgroup frequently present with comorbid behavioural insomnia (42% of our group of patients). In fact, the presentation of more than one sleep disorder in the same patient is a frequent occurrence and this makes more difficult the composition of homogeneous groups.[4,16]

Higher scores in 'Parasomnias' and 'Sleep-disordered breathing' subscales have been found within each clinical subgroup. More problems were found in 'Night wakings' subscale at this level within the Behavioural Insomnia and Parasomnias subgroups (in which partial arousals occur).

Globally, the differences in CSHQ-PT subscales between the clinical subgroups have shown discriminatory validity for the evaluation of the most frequently found sleep disorders. As expected, a higher RDI was found in clinical groups when compared to the control group.

The analysis of the ROC curve of the RDI allowed for the identification of a 48 cut-off index for the screening of sleep disorders, which presents as more appropriate for the Portuguese population than what has been recommended by the original validity study (41).[3] This value was in line with what was recommended by Silva *et al.* based on the assessment of a non-clinical group of Portuguese children.[4] The assessment of the RDI does not replace the analysis of subscales and individual items/symptoms, given to the predominance of behavioural items. In addition, it is worth mentioning that a positive screening does not correspond to a diagnosis, rather requiring the integration of the results with the patient's medical history, medical examination and possible diagnostic testing within a clinical setting.

A higher RDI value was found in the clinical ADHD group when compared to the other groups, as well as in 'Sleep anxiety' and 'Parasomnias' subscales. A higher incidence of sleep disorders in children with ADHD has also been described in other studies using the CSHQ.[5,17-21] In fact, the application of the 48 RDI cut-off in the ADHD group corresponds to a positive screening of sleep disorders in 40.7% of the patients, in line with what has been found in our study (44.8% of the patients with moderate sleep problems).[22] As a group, children with ADHD present with more sleep-related problems. For this reason, the screening of sleep disorders is crucial in this population, even more so because sleep disorders could trigger similar symptoms or worsen ADHD clinical characteristics.[21]

We are aware of some limitations of this study. In line with other previous validity studies, convenience samples have been used, which could not represent the study population. Still, no significant differences in sleep disorders related to parents/caregivers education, population density of the place of residence and with the recruiting location (public *vs.* private schools) were found in a previous study with Portuguese children.[6] In addition, the systematic clinical assessment of sleep disorders in the control group beyond the filling out of the questionnaire was not ensured, in line with the American validity study.[3] The response rate (70.9%) was quite reasonable, when compared to the original validity study (46.9%) and with the validity study by Silva *et al.* (74%).[10] The small sample size of the ADHD clinical group was another limitation of the study and therefore any relationship between sleep problems and the form of presentation was not allowed.

Questionnaire validity is an ongoing task. The identification of the characteristics of sleep problems associated with other populations within clinical settings and the efficacy of prevention programs or treatment of sleep disorders will be made possible in further studies by use of this instrument.

CONCLUSION

Adequate psychometric properties in children with sleep disorders and ADHD were shown by the Portuguese version of the Children's Sleep Habits Questionnaire. A 48 RDI cut-off value is more appropriate for the Portuguese population than the one recommended by the American validity study. This is therefore a useful instrument for screening and research of these disorders in Portuguese children.

HUMAN AND ANIMAL PROTECTION

The authors declare that the followed procedures were according to regulations established by the Ethics and Clinical Research Committee and according to the Helsinki Declaration of the World Medical Association.

DATA CONFIDENTIALITY

The authors declare that they have followed the protocols of their work centre on the publication of patient data**.** Informed consents were obtained.

CONFLICTS OF INTEREST

The authors declare that there were no conflicts of interest in writing this manuscript.

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