

## Validation and cross-cultural adaptation of the Pediatric Sleep Questionnaire Sleep-Related Breathing Disorder Scale (PSQ-SRBD) to Spanish language

### Validación y adaptación transcultural de la Escala de Trastornos Respiratorios del Sueño del Cuestionario de Sueño Pediátrico (PSQ-SRBD) a idioma español

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#### What do we know about the subject matter of this study?

Sleep-related breathing disorders (SRBD) in pediatric patients have serious consequences. Polysomnography is the diagnostic gold standard; however, it is expensive and difficult to access. Therefore, there is a need for valid, effective, and easy-to-use tools to identify SRBD.

#### What does this study contribute to what is already known?

The PSQ-SRBD was cross-culturally adapted and validated. The PSQ-CL was created from the translation of the PSQ-SRBD into Chilean Spanish. Its reliability and internal consistency were measured. An overall internal consistency of the PSQ-CL was obtained by Cronbach's alpha of 0.71. The discrimination capacity of the PSQ-CL was 81% (cut-off score 0.227 points) with a sensitivity and specificity of 73.08% and 77.68%, respectively.

#### Abstract

In the Chilean pediatric population, to date, there is no validated screening instrument for sleep-related breathing disorders (SRBD). **Objective:** to develop and validate a cross-cultural adaptation of the Pediatric Sleep Questionnaire - sleep-related breathing disorder scale (PSQ-SRBD), by creating the Chilean Spanish version (PSQ-CL). **Patients and Method:** The PSQ-SRBD was translated from English into Chilean Spanish, obtaining the PSQ-CL, which was subsequently validated. Internal consistency was determined through Cronbach's alpha coefficient in 26 children with obstructive sleep apnea confirmed by polysomnography and in 112 controls. Reliability was obtained through the test-retest method. **Results:** In the pilot group, the overall internal consistency of the PSQ-

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CL through Cronbach's alpha was 0.71 and the internal consistency was 0.653, 0.566, and 0.808 in subscales A, B, and C, respectively. The discrimination capacity of the PSQ-CL questionnaire established through ROC analysis was 81%, determining a cut-off score of 0.227 with a sensitivity of 73.08% and a specificity of 77.68%. **Conclusions:** The PSQ-CL is a suitable instrument for screening sleep-disordered breathing in Chilean children. This instrument may be useful in clinical practice and epidemiological research in the Chilean pediatric population and could be used for multicenter studies.

## Introduction

Sleep-related breathing disorders (SRBD) are characterized by ventilation disturbance during sleep. Their spectrum of presentation varies from primary snorer to obstructive sleep apnea-hypopnea syndrome (OSAHS)<sup>1</sup>. SRBD in pediatric patients are usually underdiagnosed, with clear consequences that include hyperactivity, inattention, daytime sleepiness, poor school performance, and neurocognitive deficit, among others. In addition, it could cause poor post-natal growth, hypertension, heart failure, systemic inflammation, and a strong impact on quality of life<sup>2-6</sup>. In children without underlying pathologies, SRBD are mainly due to adenotonsillar hypertrophy and can be associated to other anatomical and/or functional alterations of the upper airway, maxillomandibular anatomical alterations, and obesity<sup>4</sup>.

Overnight polysomnography (PSG) is the diagnostic gold standard for SRBD; however, it is a time-consuming, expensive, and difficult-to-access test<sup>3,7</sup>. It is therefore necessary to have effective and easy-to-apply tools that can help in the screening diagnosis of SRBD in children and adolescents, thus preventing the morbidity associated with this pathology<sup>4</sup>.

The Pediatric Sleep Questionnaire for Sleep-Related Breathing Disorders (PSQ-SRBD) is a useful tool for screening children with SRBD. It was developed by Chervin et al. and contains 22 items orientated to SRBD symptoms such as snoring, observed apneas, difficulty breathing during sleep, daytime sleepiness, and hyperactive behavior. This questionnaire has a good sensitivity (81%) and specificity (87%) in the detection of OSAHS. It is divided into three subscales: subscale A which includes questions on snoring, subscale B on excessive daytime sleepiness, and subscale C on hyperactivity. In subscales A and B, the answers are "yes" = 1, "no" = 0, and "don't know" = missing, unlike subscale C, where the answers are "never", "sometimes", "frequently", and "almost always". Chervin et al. describe an internal consistency by Cronbach's alpha for subscale A (snoring) of 0.86, for subscale B (excessive daytime sleepiness) of 0.66, for subscale C (hyperactivity) of 0.84, and 0.89 for the total PSQ-SRBD. The cut-off

score of the PSQ-SRBD is 0.33 and therefore a score greater than this value was highly suggestive to the presence of SRBD in the pediatric population<sup>8</sup>.

The PSQ-SRBD is a widely used tool both in research and clinical practice. It was originally published in English and has now been validated in several languages, including French, Portuguese, and Brazilian Portuguese<sup>2,8-10</sup>. In a study conducted in Spain, Vila et al. validated the Spanish version of the PSQ<sup>11</sup>.

When applying this version of the PSQ to the Chilean pediatric population, the prevalence of pediatric SRBD ranged from 17.7% to 25.3%<sup>12,13</sup>. However, it should be considered that the Spanish language spoken in Spain presents relevant linguistic differences with the Spanish spoken in Chile. This aspect can make it difficult to understand some questions of the PSQ-SRBD in the Chilean population, being a source of errors. It is important to note that, when translating an original questionnaire into another language, one cannot simply assume that the translated items are valid. The process of translating a questionnaire should focus on achieving conceptual equivalence rather than linguistic equivalence. Adaptation recognizes and considers semantic, grammatical, conceptual, and other differences that exist between similar languages, which supports the need to translate and cross-culturally adapt questionnaires to the language spoken in the country where the instrument is to be applied<sup>9,14-16</sup>. In fact, there is a Portuguese version of the PSQ-SRBD validated in Portugal and a different one validated in Brazil<sup>9,10</sup>. To date, there is no validated instrument for the detection of SRBD in the Chilean pediatric population like the PSQ-SRBD. The objective of this study was to carry out the cross-cultural adaptation and validation of the PSQ-SRBD by creating the Chilean Spanish version (PSQ-CL).

## Patients and Method

### *Participants and study design*

The process of cross-cultural adaptation and validation of the survey was conducted between December 2018 and April 2019. The clinical application of

the PSQ-SRBD was performed in patients attending *Clínica Alemana* Hospital in Santiago, Chile, between August 2019 and February 2021.

### ***Cross-cultural adaptation - Validation and reliability of the instrument (PSQ-CL)***

To obtain the cross-cultural adaptation of the PSQ into Chilean Spanish, three bilingual health professionals performed the translation of the PSQ-SRBD in English into Chilean Spanish<sup>2</sup>. Then, two native English speakers, who were unfamiliar with the original questionnaire, performed a back-translation. Subsequently, the back-translation was compared with the original English questionnaire and those questions that differed from the original version were adapted.

A focus group randomly formed by ten Chilean mothers of children between 2 and 18 years evaluated the questionnaire obtained. Finally, a group of experts formed by four specialists in sleep medicine, with extensive experience in the use of surveys in the area, made the final grammatical corrections and changed those terms that could be difficult for the Chilean reader to understand, thus obtaining the Chilean Spanish version of the PSQ (PSQ-CL) (figure 1).

To determine the validity and reliability of the Chilean version of the PSQ (PSQ-CL), a test-retest was applied to a pilot group of 29 Chilean participants. Caregivers of children between 2 and 18 years of age were recruited to observe the behavior and sleep quality of their children and to answer the PSQ-CL at two different times, under similar conditions and with a time interval between surveys of less than one month. The reliability coefficient, which represents the stability of the questionnaire over time, was calculated<sup>17</sup>. Internal consistency (reliability) was determined by Cronbach's alpha coefficient, where "0" corresponds to zero reliability (measurement errors) and "1" to maximum reliability. The closer the value obtained is to "1", the greater the reliability of the instrument. Overall, values above 0.70 are acceptable and values above 0.90 are excellent<sup>18</sup>.

### ***Clinical application and sensitivity assessment***

The patients (with OSAHS) were boys and girls referred by a sleep specialist to the pediatric sleep unit due to suspected OSAHS and in whom this diagnosis was confirmed by overnight PSG. The control group was conformed of children without syndromic diseases who attended pediatric consultation for reasons other than SRBD. Children with a previous diagnosis of OSAHS, history of snoring, allergic rhinitis, and asthma were excluded as well as those under treatment with corticosteroids, oral antihistamines, and antileukotrienes.

The instrument was administered to the OSAHS group minutes before they underwent PSG. To the control group, the questionnaire was administered in the waiting room before their medical consultation.

An overnight PSG was performed according to the international standards of the American Academy of Sleep Medicine (AASM)<sup>19</sup>. The PSG analysis was performed without knowledge of the results of the PSQ-CL questionnaire. The presence and severity of OSAHS were assessed using the apnea-hypopnea index (AHI), defined as the number of apneas and hypopneas per hour of total sleep time. Obstructive apneas were defined as the absence of nasal flow with the presence of thoracoabdominal effort for at least two respiratory cycles. Hypopneas were defined as a decrease in nasal flow of at least 30%, with a desaturation of 3% or the presence of micro-arousals. OSAHS was defined as an AHI of > 1 event per hour of sleep and was classified as mild (AHI between 1 and 4.9 events per hour of sleep), moderate (AHI between 5 and 10 events per hour of sleep), and severe (AHI > 10 events per hour of sleep)<sup>19,20</sup>.

### **Statistical Analysis**

Data are presented as mean, standard deviation, frequencies, and percentages. Absolute numbers and percentages were compared with Fisher's exact test of independence. If the variables were quantitative with symmetrical or normal distribution, they were described with percentages and standard deviation, and compared with Student's t-test. The nutritional status of the participants was established by standardizing the body mass index (BMI) (BMI z-score), according to the World Health Organization<sup>21</sup>.

The sensitivity of the PSQ-CL was calculated as the proportion of individuals correctly diagnosed with SRBD by the diagnostic test (true positives). The specificity of the PSQ-CL was calculated as the proportion of individuals correctly diagnosed without SRBD by the diagnostic test (true negatives)<sup>22</sup>.

Specific statistical tests were applied: test-retest and Cronbach's alpha coefficient to determine the reliability and validity of the instrument, respectively. A ROC curve was constructed to identify the cut-off value, with sensitivity and specificity determined to identify the probability of having OSAHS.

A statistical significance of 5% and a confidence interval of 95% were used. A  $p < 0.05$  value was considered significant. STATA version 15 software was used to process the data.

The questionnaire and methodology of this study were approved by the Ethics Committee of the *Universidad del Desarrollo, Clínica Alemana*, Santiago (2019-007).

**Instrucciones:** Por favor conteste las siguientes preguntas con respecto al comportamiento de su hijo/a durante el sueño y al despertar. Las preguntas se refieren al comportamiento general de su hijo, no necesariamente durante los días recién pasados, pues estos pueden no correlacionarse con el comportamiento típico si él o ella no se ha encontrado bien.

Si no está seguro/a en cómo contestar cualquier pregunta, por favor tenga la libertad de preguntarle a otro tutor/cuidador del niño (a).

Escriba cuidadosamente su respuesta en el espacio entregado. "S" significa sí, "N" significa no y "NS" significa no sé. Sí ("S") significa más de la mitad del tiempo o en más de la mitad de las noches.

<p><b>Conducta durante la noche y mientras duerme:</b>            Cuando duerme su hijo/a...            ... ¿ronca más de la mitad del tiempo?            ... ¿ronca siempre?            ... ¿ronca de forma ruidosa?            ... ¿tiene una respiración ruidosa o "pesada"?            ... ¿tiene problemas o dificultad para respirar?</p> <p>Alguna vez...            ... ¿ha visto a su hijo/a parar de respirar durante la noche?</p> <p>Su hijo/a...            ... ¿tiene tendencia a respirar por la boca durante el día?            ... ¿tiene la boca seca cuando se despierta por las mañanas?            ... ¿ocasionalmente se hace pipí (orina) en la cama?</p>	Si (S)	No (N)	No sé (NS)	
<p><b>Conducta durante el día y otros problemas posibles:</b>            ¿Su hijo/a se despierta en la mañana sintiendo que no descansó?            ¿Su hijo/a tiene problema de somnolencia (sueño excesivo) durante el día?            ¿Su profesor o cualquier otro cuidador le ha comentado alguna vez que su hijo/a parece estar somnoliento (sueño excesivo) durante el día?            ¿Le cuesta despertar a su hijo/a por las mañanas?            ¿Su hijo/a se despierta con dolor de cabeza por las mañanas?            ¿Su hijo/a ha parado de crecer a un ritmo normal (según control pediátrico) en algún momento desde que nació?            ¿Su hijo/a tiene sobrepeso (según control pediátrico) o pesa más de lo normal para su edad?</p>	Si (S)	No (N)	No sé (NS)	
<p><b>Por favor marque con una X, cuánto aplica cada enunciado a este niño/a</b>            Su hijo/a menudo...            ... No parece escuchar cuando se le habla directamente.            ... Tiene dificultad para organizar tareas y actividades.            ... Se distrae fácilmente con estímulos externos.            ... Agita las manos, pies o se mueve mientras está sentado.            ... Está permanentemente en marcha o a menudo moviéndose como si tuviera un motor.            ... Se entromete o interrumpe a otros (ej. intercepta conversaciones o juegos).</p>	Nunca	Algunas veces	Muchas veces	Casi siempre

**Figure 1.** Chilean version of the PSQ sleep-disordered breathing scale (PSQ-CL). Copyright 2007 The Regents of the University of Michigan. PSQ-CL survey developed from the original PSQ sleep-disordered breathing scale.

## Results

### Cross-cultural adaptation - Validation and reliability of the instrument (PSQ-CL)

The pilot group included 29 subjects who answered the survey for the adaptation and determination of the reliability of the instrument. The time interval between the first and second questionnaires was  $14.7 \pm 5.2$  days (range 7 to 23 days). An overall internal consistency of the PSQ-CL was obtained by Cronbach's alpha of 0.71. The internal consistency of sections A, B, and C were 0.653, 0.566, and 0.808, respectively. Of the 22 questions studied, 3 of them (A2, A5, and C6) obtained

100% agreement in the negative option, so they are not included in the analyses since they do not contribute to the variability of diagnostic discrimination. Supplement 2 shows each item of the PSQ-CL, the percentage of global agreement, the percentage of expected agreement, the Kappa index, and the p-value obtained through the test-retest.

### Clinical application and sensitivity of the instrument

A total of 178 patients were recruited, of whom 40 were excluded because they did not meet the inclusion criteria and/or answered the survey incompletely. Of the

138 participants included in the study, 26 formed the OSAHS group and 112 the control group. Overall, there were 78 girls (56.5%) and 60 boys (43.5%), with a mean age of  $7.8 \pm 4.3$  years. In the OSAHS group, there were 17 boys (65.38%) and 9 girls (34.62%) with a mean age of  $10 \pm 3.4$  years (range 3 to 15 years). The control group consisted of 43 boys (38.39%) and 78 girls (56.52%) aged  $7.3 \pm 4.4$  years (range 2 to 17 years). The OSAHS group and the control group were matched in age, but not in sex or BMI distribution (table 1).

According to the AHI value, the severity of OSAHS in the OSAHS group was classified as mild in 22 cases (84.62%), moderate in three (11.54%), and severe in one (3.85%). Regarding the distribution of AHI according to sex, of the 17 boys of the OSAHS group, 13 cases were mild, three cases were moderate, and one case was severe. All the girls presented mild OSAHS (table 2).

In relation to the PSQ-CL score, the difference in the mean obtained between the OSAHS group and controls was statistically significant ( $0.31 \pm 0.17$  vs.  $0.12 \pm 0.1$ ;  $p < 0.0001$ ) (figure 2).

The ROC analysis identified a discrimination capacity of the PSQ-CL of 81%, determining a cut-off score of 0.227 points with a sensitivity and specificity ratio of 73.08% and 77.68%, respectively, or at a LR (+) 3.3 (figure 3).

## Discussion

The present study has shown an agreement of the PSQ-CL of 75% -100% and a high overall internal consistency of 0.71%, so it can be concluded that the reliability of the PSQ-CL is adequate<sup>18</sup>. It should be noted that the weakest internal consistency was observed in section B, as in the study by Vila et al. carried out in Spain<sup>11</sup>.

Using a cut-off value of 0.227, this instrument demonstrated a good discrimination capacity of 81%, a sensitivity of 73%, and a specificity of 78% for detecting SRBD<sup>23</sup>. It is important to mention that a statistically significant difference was found in the score obtained between patients with OSAHS and controls. This demonstrates an optimal discrimination capacity of the PSQ-CL to distinguish SRBD in the Chilean pediatric population.

The original work published in English by Chervin et al. evaluated 54 patients with OSAHS and 108 controls between 2 and 18 years of age<sup>2</sup>. The internal consistency obtained in both groups was 0.89 and 0.88, respectively. Sensitivities of 0.85 and 0.81 and specificities of 0.87 and 0.87 were obtained in groups A and B, respectively, with a cut-off value of 0.33. In this study, similar sensitivity and specificity were obtained, with a cut-off value of 0.227. This value, although slightly

**Table 1. Characteristics of the population sample**

Variables	Patients (n = 26)	Controls (n = 112)	Total (n = 138)	P value
Male (n, %)	17 (65.38)	43 (38.39)	60 (43.48)	0.016
Female (n, %)	9 (34.62)	69 (61.61)	78 (56.52)	0.004
Age (years)	$10 \pm 3.4$	$7.29 \pm 4.4$	$7.81 \pm 4.35$	0.308
Z-score BMI	$0.39 \pm 1.12$	$-0.16 \pm 2.55$	$-0.05 \pm 2.34$	0.025
Size (cm)	$1.39 \pm 0.21$	$1.26 \pm 0.26$	$1.29 \pm 0.26$	0.020
Weight (kg)	$36.60 \pm 14.52$	$28.67 \pm 15.33$	$30.17 \pm 15.45$	

BMI: Body Mass Index.

**Table 2. Distribution of obstructive sleep apnea (OSA) according to severity**

Patients with OSA	Boys (n = 17)	Girl (n = 9)	Total (n = 26)
Severity of OSA			
Mild	13	9	22 (84.62%)
Moderate	3	0	3 (11.54%)
Severe	1	0	1 (3.85%)

Test Fisher exact: 0.365

lower than that found in the original work by Chervin et al. suggests that the PSQ-CL requires fewer positive questions for an adequate diagnostic approach.

This study included 138 patients, distributed in 112 patients in the control group (81.15%) and 26 patients in the OSAHS group (18.85%). Of those with OSAHS, most were male (68.38%), which is consistent with the information previously reported in the literature<sup>24</sup>. In addition, the severe OSAHS category was only present in one male patient and all the female patients had mild OSAHS.

The PSQ is an optimal diagnostic discrimination tool for SRBD in children. It was originally published in English and has been validated in several languages<sup>2,8-10</sup>. In the study conducted in Spain, Vila et al.

validated the Spanish version of the PSQ, using the extended version of the questionnaire (91 questions) and evaluated its reliability in 99 patients<sup>11</sup>.

It was decided to translate and validate the reduced version of the original PSQ because it is focused specifically on detecting SRBD and, being limited, it requires a shorter response time, which allows for easier distribution and practical application<sup>2</sup>.

In Chile, the Spanish version of the PSQ of Vila et al. was previously applied, obtaining an area under the ROC curve of 0.687. In this work, the area under the ROC curve was higher (0.815) which suggests that, in the Chilean population, the PSQ-CL has a greater diagnostic discrimination capacity than the version of the PSQ previously validated in Spain. This difference can be explained by the cross-cultural and local language adaptation process carried out in our study<sup>3,12</sup>. The Spanish language spoken in Spain presents linguistic and grammatical differences compared to the Spanish language used in Chile. As a result, this can lead to important errors and biases in the results for difficulties understanding the local usage of the language. This difficulty, evidenced by comparing the results of the present study with the values obtained previously, supports the need for translation and cross-cultural adaptation of the PSQ to the language spoken in the country where the instrument is to be applied<sup>11,15</sup>.

Among the limitations of this study, we highlight the relatively small sample size and that participants were recruited from a single private Chilean health center. This study could have included more participants and ideally from public health centers, as was initially intended, however, due to the COVID-19 pandemic, multiple health centers had limited resources to conduct sleep studies. We believe that it would be very useful to conduct this study including participants from public and private institutions, of different socioeconomic status, and from different regions of the country, thus obtaining a more representative sample with better applicability. Second, cases and controls were matched for age, but not for number, BMI, and sex. Strengths of this study include the complete characterization of OSAHS by PSG in all case patients and the development of the PSQ-CL by native English speakers and Chileans with expertise in sleep medicine.

## Conclusions

In this study, we have developed and validated the Chilean version of the PSQ-SRBD, showing optimal sensitivity, specificity, internal consistency, and discriminatory capacity to distinguish SRBD in the Chilean population studied. PSQ-CL is a valid, reliable, easy to apply, and low-cost instrument for screening

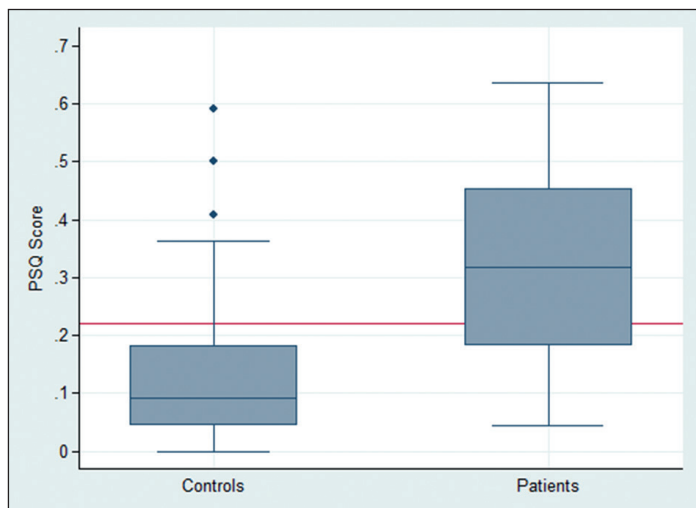


Figure 2. PSQ-CL score in patients with and without OSA.

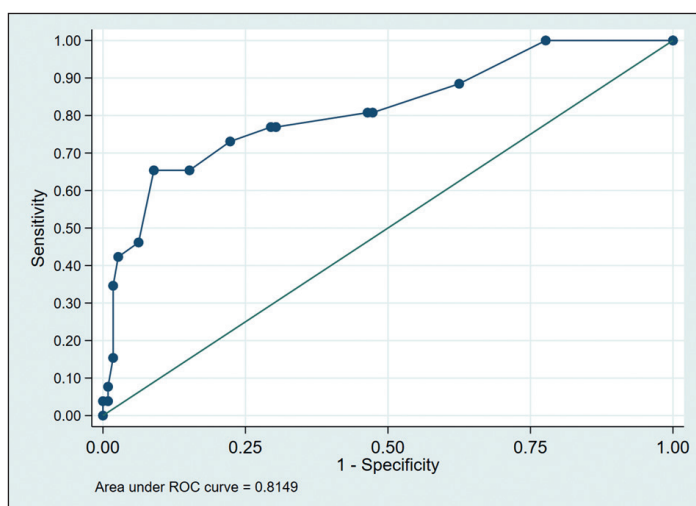


Figure 3. PSQ-CL ROC Curve. Using a cut-off score of 0.227 from the PSQ-CL scale, the ROC curve was constructed obtaining a discrimination capacity of 81%, sensitivity of 73.08% and specificity of 77.68%.

for SRBD in this population. This could be useful for many future epidemiological studies carried out in Chile.

This instrument may be used in clinical practice, as a tool to select with greater accuracy the patients who need to be referred to a specialist and/or require further study of their pathology, thus helping in the optimization of resources.

## Ethical Responsibilities

**Human Beings and animals protection:** Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

**Data confidentiality:** The authors state that they have

followed the protocols of their Center and Local regulations on the publication of patient data.

**Rights to privacy and informed consent:** The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

## Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

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To Matías Gomez MD and Fernando Oyarzo PhD

## References

- De Luca Canto G, Singh V, Major MP, et al. Diagnostic capability of questionnaires and clinical examinations to assess sleep-disordered breathing in children: A systematic review and meta-analysis. *J Am Dent Assoc.* 2014;145(2):165-78.
- Chervin RD, Hedger K, Dillon JE, Pituch KJ. Pediatric sleep questionnaire (PSQ): Validity and reliability of scales for sleep-disordered breathing, snoring, sleepiness, and behavioral problems. *Sleep Med.* 2000;1(1):21-32.
- Bertran K, Mesa T, Rosso K, Krakowiak MJ, Pincheira E, Brockmann PE. Diagnostic accuracy of the Spanish version of the Pediatric Sleep Questionnaire for screening of obstructive sleep apnea in habitually snoring children. *Sleep Med [Internet].* 2015 May [cited 2018 Nov 9];16(5):631-6. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1389945715000842>
- Marcus CL, Brooks LJ, Draper KA, et al. Diagnosis and Management of Childhood Obstructive Sleep Apnea Syndrome. *Pediatrics [Internet].* 2012 Nov 5;130(3):576-84. Available from: <http://pediatrics.aappublications.org/cgi/doi/10.1542/peds.2012-1671>
- Luginbuehl M, Bradley-Klug KL, Ferron J, Anderson WM, Benbadis SR. Pediatric Sleep Disorders: Validation of the Sleep Disorders Inventory for Students. *School Psych Rev.* 2008;37(3):409-31.
- Chervin RD, Weatherly R, Garetz SL, et al. Pediatric Sleep Questionnaire (PSQ). *Arch Otolaryngol Head Neck Surg [Internet].* 2007;133:216-22. Available from: [http://link.springer.com/10.1007/978-1-4419-9893-4\\_63](http://link.springer.com/10.1007/978-1-4419-9893-4_63)
- Brockmann PE, Schaefer C, Poets A, Poets CF, Urschitz MS. Diagnosis of obstructive sleep apnea in children: A systematic review. *Sleep Med Rev [Internet].* 2013 Nov 5;17(5):331-40. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1087079212000998>
- Jordan L, Beydon N, Razanamihaja N, et al. Translation and cross-cultural validation of the French version of the Sleep-Related Breathing Disorder scale of the Pediatric Sleep Questionnaire. *Sleep Med.* 2019 Jun;58:123-9.
- Martins CAN, Deus MM de, Abile IC, et al. Translation and cross-cultural adaptation of the pediatric sleep questionnaire (PSQ\*) into Brazilian Portuguese. *Braz J Otorhinolaryngol.* 2021 Apr;
- Certal V, de Lima FF, Winck JC, Azevedo I, Costa-Pereira A. Translation and cross-cultural adaptation of the Pediatric Sleep Questionnaire into Portuguese language. *Int J Pediatr Otorhinolaryngol.* 2015 Feb;79(2):175-8.
- Tomás Vila M, Miralles Torres A, Beseler Soto B. Versión española del Pediatric Sleep Questionnaire. Un instrumento útil en la investigación de los trastornos del sueño en la infancia. Análisis de su fiabilidad. *An Pediatría [Internet].* 2007;66(2):121-8. Available from: <http://linkinghub.elsevier.com/retrieve/pii/S1695403307703193>
- Sánchez T, Rojas C, Casals M, et al. Trastornos respiratorios del sueño en niños escolares chilenos: prevalencia y factores de riesgo. *Rev Chil pediatría [Internet].* 2018;8. Available from: <http://files/637/Sánchez et al. - Trastornos respiratorios del sueño en niños escola. pdf>
- Santelices P, Wurth C, Verdugo F, Godoy S. Prevalence of sleep related breathing disorder in children and adolescents in Santiago, Chile, by the use of the reduced pediatric sleep questionnaire. *Sleep Med [Internet].* 2017 Nov 5;40:e292. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S138994571731290X>
- Sagheri D, Wiater A, Steffen P, Owens JA. Applying principles of good practice for translation and cross-cultural adaptation of sleep-screening instruments in children. *Behav Sleep Med.* 2010;8(3):151-6.
- Escobar Bravo MÁ. Adaptación transcultural de instrumentos de medida relacionados con la salud. *Enfermería Clínica.* 2004;14(2):102-6.
- Sperber AD. Translation and validation of study instruments for cross-cultural research. *Gastroenterology.* 2004 Jan;126(1 Suppl 1):S124-8.
- Manterola C, Grande L, Otzen T, García N, Salazar P, Quiroz G. Confiabilidad, precisión o reproducibilidad de las mediciones. Métodos de valoración, utilidad y aplicaciones en la práctica clínica. *Rev Chil infectología.* 2018;35(6):680-8.
- Hernández Sampieri R, Fernández Callado C, Baptista Lucio P. Metodología de la Investigación. Quinta ed. Mc Graw Hill; 2010. 196-239 p.

19. Berry RB, Budhiraja R, Gottlieb DJ, et al. Rules for Scoring Respiratory Events in Sleep: Update of the 2007 AASM Manual for the Scoring of Sleep and Associated Events. *J Clin Sleep Med*. 2012;8(5):597-619.
20. Roland PS, Rosenfeld RM, Brooks LJ, et al. Clinical practice guideline: Polysomnography for sleep-disordered breathing prior to tonsillectomy in children. *Otolaryngol - Head Neck Surg*. 2011;145(SUPPL.1).
21. Chou JH, Roumiantsev S, Singh R. PediTools electronic growth chart calculators: Applications in clinical care, research, and quality improvement. *J Med Internet Res*. 2020;22(1).
22. Salech F, Mery V, Larrondo F, Rada G. Estudios que evalúan un test diagnóstico: interpretando sus resultados. *Rev Med Chil* [Internet]. 2008;136(1):1203-8. Available from: <http://www.scielo.cl/pdf/rmc/v136n9/art18.pdf>
23. Cronbach LJ. Coefficient alpha and the internal structure of tests. *Psychometrika* [Internet]. 1951;16(3):297-334. Available from: <https://doi.org/10.1007/BF02310555>
24. Lumeng JC, Chervin RD. Epidemiology of pediatric obstructive sleep apnea. *Proc Am Thorac Soc*. 2008;5(2):242-52.