

# Validation of the Filipino Version of the Pittsburgh Sleep Quality Index (PSQI) in Perpetual Help Medical Center – Biñan and University of Perpetual Help Biñan

Kris Anne N. Bernabe, MD,<sup>1</sup> Rosalina B. Espiritu-Picar, MD,<sup>2</sup>

## Abstract

**Introduction:** Sleep health is essential to overall physical, mental and neurobehavioral well-being. Poor sleep quality has been linked to numerous health conditions, impaired school and work performance and increased risk for accidents. Hence, evaluation of a person's sleep health is vital to any medical examination. Questionnaires such as Pittsburgh Sleep Quality Index (PSQI) have an important role in the preliminary evaluation of sleep health. PSQI has been regarded as the standard instrument to measure sleep quality. It has been translated into several languages and has been validated in various populations. This study aimed to assess the validity and reliability of the Filipino version of the PSQI.

**Methods:** The Filipino version of the PSQI was administered to 200 adult subjects. After 24-48 hours, the English version of the PSQI was administered to the same respondents. Basic demographic information, co-morbidities and use of medications were obtained. Cronbach's alpha and Kappa test of agreement were measured to test the reliability of the Filipino version while confirmatory factor analysis was used to determine the validity of the translated tool.

**Results:** The Filipino version of the PSQI was reliable with Cronbach's alpha of 0.70. The agreement coefficient of all items in the questionnaire were all above 0.81 indicating a very good level of agreement between the English and Filipino versions. Confirmatory factor analysis showed that items Q1, Q3, Q4, Q5a-Q5i, Q6, Q7, Q8 and Q9 were significant with p-values below 0.05. Overall, as measured by the Goodness of fit, it showed that the items in the Filipino version of the questionnaire are directly correlated with English PSQI Score.

**Conclusion:** The Filipino version of the PSQI is a valid and reliable instrument to assess sleep quality.

**Keywords:** sleep, sleep questionnaire, sleep quality

## Introduction

An increasing trend in the prevalence of sleep disorders has been reported in various journals. The growing population of shift workers and part-time jobs, and the widespread use of the internet, television and mobile phones contributed to this upsurge.<sup>1-3</sup> A journal reported a prevalence rate of lack of sleep between 20% and 41.7% in the general population.<sup>4</sup> Another data suggested that 58% of adults 50 years old and above do not get enough sleep.<sup>5</sup> In the Philippines, there are limited data on the incidence of sleep disorders. According to Health Living Index Survey in 2016,

Philippines has one of the highest rates of sleep deprivation in Asia. Forty six percent of Filipinos do not get enough sleep and 32% sleep for less than six hours.<sup>6</sup>

Sleep health is important as it is essential to overall physical, mental and neurobehavioral well-being. A sleep disorder can be a symptom of a disease. Hence, sleep assessment is vital to any medical examination.<sup>5,7</sup> Poor sleep quality has been linked to numerous health conditions, work-related injuries and increased risk for accidents. Immediate effects of poor sleep quality may cause impairment in school and work performance as well as social relationships.<sup>8</sup> Long term effects may lead to poor health conditions such as cardiovascular diseases, obesity, diabetes and impaired glucose tolerance, and psychiatric disorders such as anxiety and depression.<sup>2,9-10</sup> For those reasons, the interest in the study of sleep has been rising rapidly.

<sup>1</sup> Resident, Department of Internal Medicine, Perpetual Help Medical Center Biñan, Biñan City, Laguna, Philippines

<sup>2</sup> Active Consultant, Section of Neurology, Department of Internal Medicine, Perpetual Help Medical Center Biñan, Biñan City, Laguna, Philippines

Corresponding author: Kris Anne N. Bernabe, M.D., Email: keksbernabe@gmail.com

The scarcity of data on sleep disorders in the country may be associated to limited resources. Polysomnography, multiple sleep latency test, maintenance of wakefulness test, continuous positive airway pressure (CPAP) titration test and home sleep test are objective measures used to detect sleep disorders.<sup>11</sup> However, sleep laboratory in the country is not always readily available. Furthermore, the cost of sleep studies is high. Hence, questionnaires which are instruments used for baseline evaluation of sleep disorders are being utilized. Questionnaires are self-administered, inexpensive and rapid tests. Questionnaires do not replace sleep studies but are used for preliminary assessment.

This study aimed to assess the validity and the reliability of the Filipino version of the PSQI by determining its construct validity, and internal consistency and inter-rater reliability, respectively. The instrument, once validated, can be used for future clinical researches which will eventually improve the country's epidemiological data on sleep. In addition, the validated questionnaire can be an effective tool for general clinicians to initially screen patients needing further assessment by sleep specialists, especially in those areas that have limited access to sleep studies.

## Materials and Methods

*Study Design.* This is a prospective study that validated the Filipino version of the PSQI as a tool to assess sleep quality among subjects in Perpetual Help Medical Center Biñan and University of Perpetual Help Biñan.

*Study Setting.* This study is a single center approach wherein data collection was conducted at Perpetual Help Medical Center Biñan and University of Perpetual Help Biñan.

*Questionnaire.* Mapi Language Services conducted the linguistic validation of PSQI into different languages which included Filipino. The linguistic validation process and linguistic certificate were provided by the Mapi Language Services. The Filipino version of PSQI was translated through two forward translations by professional translators. The translation was back-translated into English by another professional translator. The translations were critically analyzed and compared with original English version. A clinician then reviewed and analyzed the translated version. Cognitive interviews were facilitated on five patients with major depressive disorder, generalized anxiety disorder and sleeping disorder. Analysis, quality control, and international harmonization were done. Proofreading and finalization were then performed achieving the final target language version.<sup>12-13</sup>

PSQI is composed of 19 questions regarding sleep quality and disorders in the previous month. Seven sleep components are evaluated by PSQI: subjective quality of sleep, sleep latency, sleep duration, sleep efficiency, sleep disturbances, sleep medication use and daytime dysfunction. The score can range from 0 to 3 for each component. A score of "0" indicates no difficulty and a score of "3" indicates severe difficulty. The scores of the

components will be added to yield one global score ranging from 0-21. Scores above 5 points indicate poor quality of sleep. The first four questions ask about bed time, number of minutes before falling asleep, time of waking up and hours of sleep per night. These questions together with question 5a constitute the sleep latency and sleep efficiency components of the PSQI. Questions 5, 7, 8 evaluate for presence of sleep disturbances, use of sleeping medications and daytime dysfunction. These questions are answerable by a 4-point Likert scale of frequency. Questions 6 and 9 assess for subjective sleep quality and daytime dysfunction, respectively.<sup>13</sup>

*Number of Subjects.* The sample size was computed using G\*Power. The effect size used was based on study titled "Validation of the Filipino version of the Epworth Sleepiness Scale" by Albay, A. B. et al (2015).<sup>14</sup> According to this, the scenario "Sitting quietly after lunch without alcohol" was the least valid domain correlated with ESS with Cramer's coefficient of 0.346 while the scenario "As a passenger in a car for an hour without break" was item highly correlated with ESS. The computed sample size for the study was 138 with an exact power of 99.03%.

*Screening the Subjects.* The questionnaire was administered to 200 individuals in Perpetual Help Medical Center-Biñan. The subjects were screened and excluded based on the inclusion and exclusion criteria.

*Subject Selection Criteria. Inclusion Criteria:* Adults (>18 years old) comprising of employees, nurses, staff, and doctors who can understand both English and Filipino. The respondents reached at least secondary level of education.

One criterion of a good validation study is that the questionnaire is used in a sample representative to which the instrument will be used. Sleep disorders can be present in any age group and has been widely studied in different populations. In order to represent different population groups, the subjects selected in this study are adults who are employees and hospital staff.

*Exclusion Criteria.* Individuals coming from night shift duty before administration of questionnaires and those with inadequate questionnaire completion.

*Informed Consent.* Written informed consent was obtained, signed by the subject, in accordance with the International Conference on Harmonization, Good Clinical Practice, Case Report Form regulations and Perpetual Help Medical Center - Biñan Laguna research policies and using a form that was approved by the institution's Internal Review Board (IRB).

*Study Procedures.* The Filipino version of the PSQI was administered to 200 adult subjects from Perpetual Help Medical Center by convenience sampling. Posters were placed in designated areas within the hospital, voluntarily inviting subjects to participate in the study. After 24-48 hours, the original version of the PSQI was administered to the same respondents. Since the study was conducted in a hospital, majority of the respondents included in the study were shift workers such as nurses, medical technologists, radiologic technologists, etc. Regularly,

**Table I: Demographic and Clinical Profile of the Participants**

	N	%
Age (Mean, SD)	30.893	7.634
Gender		
Male	70	35%
Female	130	65%
BMI		
<18.5 (Underweight)	13	6.5%
18.5-22.9 (Normal)	80	40%
23-24.9 (Overweight)	37	18.5%
25-29.9 (Pre-Obese)	55	27.5%
≥30 Obese	15	7.5%
Average BMI: 24.054		
Level of Education		
High School	2	1.0%
Vocational	1	0.5%
College	177	88.5%
Post-Graduate	10	5.0%
Medical Doctor	10	5.0%
Occupation		
Employed	189	94.5%
Unemployed	11	5.5%
Past Medical History	36	18.0%
Bronchial Asthma	11	30.6%
Hypertension	11	30.6%
Polycystic Ovary Syndrome	6	16.7%
Diabetes Mellitus II	4	11.1%
Others	4	11.1%
Medications Currently Taking	17	8.5%
Medications for hypertension	8	47.0%
Medications for diabetes	2	11.8%
Medications for hypertension and diabetes	2	11.8%
Others	5	11.8%
Smokers	14	7.0%
Alcohol drinkers	43	21.5%

shift workers change their schedule every 72 hours thus the interval between administration of the questionnaires was suitable. The data collection was completed in two months. The scores of the original and the Filipino version of the PSQI were compared and analyzed.

**Data Analysis Tools.** Basic demographic information including age, gender, body mass index, level of education, occupation, comorbidities and use of medications were collected. A form was provided along with the questionnaire. Frequency, percentage, mean, standard deviation, median, and range (Mn-Max) were used to describe the demographic and clinical variables of the study. Confirmatory factor analysis was used to determine the validity of the Filipino version while Kappa test of agreement and Cronbach's alpha were used to test the reliability of the translated tool. STATA version 15.0 was used for data analysis. Null hypothesis was rejected at 0.05-alpha level of significance.

## Results

A total of two hundred participants completed the study. Mean age of the participants was 30.893. Seventy of the participants were males and 130 were females. The average body mass index of the participants is 24.054. One hundred eighty-eight reached tertiary level of

**Table II: PSQI scores in the English and Filipino versions of the PSQI**

Scores	English		Filipino	
	N	%	N	%
1	3	1.5%	3	1.5%
2	8	4.0%	9	4.5%
3	17	8.5%	19	9.5%
4	29	14.5%	30	15.0%
5	39	19.5%	36	18.0%
6	28	14.0%	33	16.5%
7	23	11.5%	19	9.5%
8	19	9.5%	21	10.5%
9	12	6.0%	7	3.5%
10	5	2.5%	8	4.0%
11	8	4.0%	6	3.0%
12	5	2.5%	3	1.5%
13	1	0.5%	4	2.0%
14	1	0.5%	0	0.0%
15	2	1.0%	2	1.0%
<b>Average</b>	6.015	2.715	6.125	2.699

**Table III: Subjects with global scores of 5 and above**

	Filipino	English
Number of participants with scores of 5 and above	139	143
Proportion (N = 200)	69.50%	71.50%
<b>P-value</b>	0.6614	

\* $p > 0.05$

education. One hundred eighty-nine of the participants were employed.

Hypertension and bronchial asthma were the most common illnesses noted. Seventeen of them were taking maintenance medications, mostly for hypertension. Fourteen of the participants were smokers and 43 were alcoholic drinkers. *Table I* summarizes the characteristics of the study participants.

The PSQI scores of the participants are shown in *Tables II, III* and *IV*. Scores 5 points and above indicate poor sleep quality. The global scores of the participants as well as the scores of the components of the PSQI (*Table IV*) in the English and Filipino versions showed no significant difference. One hundred thirty-nine participants (69.5%) have poor sleep quality. Among the PSQI components, sleep efficiency and sleep disturbances were the two components in which the subjects obtained poor results. Sleep efficiency is the ratio of total sleep time to time in bed. The normal sleep efficiency is 85% and above. One hundred eighty-seven participants (93.5%) had sleep efficiency of 84% and below. One hundred sixteen participants (58%) reported sleep disturbances during the past month. In addition, majority of the participants (70%) also reported mild daytime dysfunction.

To evaluate the reliability of the questionnaire, the internal consistency of the questionnaire was tested using Cronbach's alpha. Inter-rater reliability was measured using Kappa test of agreement.<sup>15</sup>

**Table IV: The distribution of the PSQI scores**

PSQI Component	Subcomponent	Filipino	English	P-value
Sleep quality	very good (0)	83 (41.5%)	90 (45%)	0.939
	fairly good (1)	94 (47%)	87 (43.5%)	
	fairly bad (2)	22 (11%)	23 (11.5%)	
	very bad (3)	1 (0.5%)	0 (0%)	
Sleep latency	0	30 (15%)	36 (18%)	0.928
	1	148 (74%)	143 (71.5%)	
	2	20 (10%)	20 (10%)	
	3	2 (1%)	1 (0.5%)	
Sleep duration	>7 hours (0)	174 (87%)	172 (86%)	0.999
	6-7 hrs (1)	18 (9%)	18 (9%)	
	5-6 hrs (2)	8 (4%)	9 (4.5%)	
	<5 hrs (3)	0 (0%)	1 (0.5%)	
Sleep efficiency	>85 % (0)	13 (6.5%)	13 (6.5%)	0.997
	75-84% (1)	69 (34.5%)	71 (35.5%)	
	65-74% (2)	87 (43.5%)	86 (43%)	
	<65% (3)	31 (15.5%)	30 (15%)	
Sleep disturbances	0	84 (42%)	86 (43%)	0.965
	1	54 (27%)	49 (24.5%)	
	2	38 (19%)	42 (21%)	
	3	24 (12%)	23 (11.5%)	
Use of sleep medication	Not during the past month (0)	155 (77.5%)	156 (78%)	0.916
	Less than once a week (1)	25 (12.5%)	24 (12%)	
	Once or twice a week (2)	9 (4.5%)	9 (4.5%)	
	Three or more times a week (3)	11 (5.5%)	7 (3.5%)	
Daytime dysfunction	0	6 (3%)	8 (4%)	0.658
	1	140 (70%)	149 (74.5%)	
	2	52 (26%)	40 (20%)	
	3	2 (1%)	3 (1.5%)	

\* $p > 0.05$ 

The Cronbach's alpha of the Filipino version of the questionnaire was reliable with Cronbach's alpha of 0.70 (Table V). This was similar to the English version of the tool with Cronbach's alpha of 0.70. The original validation study of PSQI showed good internal consistency with Cronbach's alpha of 0.83.

Table VI showed the agreement between the PSQI original version and the Filipino version. As observed, the agreement coefficient of items is above 0.81 which means that there is a very good level of agreement between English version and the Filipino version.

**Table V: Reliability of the questionnaire using Cronbach's Alpha**

	Cronbach Alpha	Decision
Filipino	0.70	Reliable
English	0.70	Reliable
English (original validation study)	0.83	Reliable

To test the validity of the questionnaire, construct validity was determined through confirmatory factor analysis (Table VII). Confirmatory factor analysis showed that items Q1, Q3, Q4, Q5a-Q5i, Q6, Q7, Q8 and Q9 were significant with p-values below 0.05. This means that these items were correlated to English PSQI Score. Item Q5j was not significant because this item inquired about other reasons for the participant's sleep disturbance which is also answerable by a 4-point Likert scale of frequency. From our data, item Q2 was not significant when measured as an independent factor. It needs a factor associated with it for it to be significant, which is item Q5a. Q2 asks how long in minutes the participant usually fall asleep each night and Q5a asks how frequent the participant cannot get to sleep within 30 minutes. Items Q2 and Q5a constitute the sleep latency component of the PSQI. Overall, as measured by the Goodness of fit, it showed that the items in the Filipino version of the questionnaire are directly correlated with English PSQI Score.

**Table VI: Agreement of items of Filipino and English questionnaire**

	Agreement Coefficient	Standard Error	Interpretation
Q1	0.874	0.033	Very Good
Q2	0.866	0.034	Very Good
Q3	0.870	0.037	Very Good
Q4	0.871	0.037	Very Good
Q5			
5a	0.912	0.021	Very Good
5b	0.883	0.027	Very Good
5c	0.912	0.023	Very Good
5d	0.855	0.040	Very Good
5e	0.843	0.039	Very Good
5f	0.886	0.030	Very Good
5g	0.873	0.027	Very Good
5h	0.892	0.030	Very Good
5i	0.828	0.044	Very Good
5j	0.861	0.045	Very Good
Q6	0.830	0.040	Very Good
Q7	0.921	0.051	Very Good
Q8	0.918	0.025	Very Good
Q9	0.914	0.024	Very Good
PSQI Score	0.987   Accuracy: 99.92%		Very Good

\* < 0.20 Poor; 0.21 – 0.40 Fair; 0.41 – 0.60 Moderate; 0.61 – 0.80 Good; 0.81 – 1.00 Very Good

**Table VII: Construct Validity of the items through Confirmatory Factor Analysis**

	Coefficient	P-value	Interpretation
Filipino Q1	0.955	0.000	Significant
Filipino Q2	-0.184	0.300	Not Significant
Filipino Q3	0.027	0.000	Significant
Filipino Q4	0.928	0.004	Significant
Filipino Q5	-0.766	0.000	Significant
Filipino Q6	1.123	0.000	Significant
Filipino Q7	0.869	0.000	Significant
Filipino Q8	0.630	0.000	Significant
Filipino Q9	0.805	0.000	Significant
Filipino Q5			
5a	0.111	0.000	Significant
5b	0.111	0.000	Significant
5c	0.111	0.000	Significant
5d	0.111	0.000	Significant
5e	0.112	0.000	Significant
5f	0.111	0.000	Significant
5g	0.111	0.000	Significant
5h	0.112	0.000	Significant
5i	0.111	0.000	Significant
5j	0.000	0.355	Not Significant

\*Goodness of Fit p-value = 0.000 (Significant)

## Discussion

A translation of an original instrument must be conceptually equivalent to the original version and must be easily understood by the population to whom it is intended to be administered. A good research instrument must be reliable and valid in order for it to provide sound results. However, a research instrument cannot be valid if it is not reliable. Reliability is the degree

to which an instrument produces consistent results while validity deals with how accurate an instrument is at measuring what it is intended to measure.<sup>19-20</sup>

In this study, the internal consistency of the questionnaire was determined to evaluate the reliability of the tool. Internal consistency is the extent to which the items on a questionnaire measure the same idea. It is commonly estimated using the coefficient alpha, also known as Cronbach's alpha. The closer the value to 1.0, the greater the internal consistency of the items in the scale, the more reliable the questionnaire is. A Cronbach's alpha of 0.70 and above indicates adequate internal consistency. The original validation study of PSQI showed good internal consistency with Cronbach's alpha of 0.83. The Cronbach's alpha of the Filipino version of the questionnaire was reliable with Cronbach's alpha of 0.70. This was similar to the English version of the tool with Cronbach's alpha of 0.70. The scores for the Filipino version of the PSQI showed adequate internal consistency which confirmed that the questionnaire is reliable. This is similar to the previous studies that tested the reliability of the PSQI in other languages.<sup>8,16-18</sup>

Another tool that was used to determine the reliability of tool was the Kappa Test of Agreement. This statistic measures the inter-rater reliability which is the degree of agreement among multiple raters which is determined by correlation of the scores. The strength of the Kappa coefficients are interpreted as follows: < 0.20 Poor; 0.21 – 0.40 Fair; 0.41 – 0.60 Moderate; 0.61 – 0.80 Good; 0.81 – 1.00 Very Good.<sup>15,19-20</sup> In this study, the agreement coefficient of the items are all above 0.81 which illustrates that there is a very good level of agreement between English version and the Filipino version, indicating that the questionnaire is reliable.

The validity of the questionnaire was assessed by evaluating construct validity through the confirmatory factor analysis. Construct validity measures the nearness of the two questionnaires in achieving its goal of assessing sleeping quality.<sup>15,19-20</sup> Correlations between the Filipino version and the English version were evaluated. Confirmatory factor analysis showed that items Q1, Q3, Q4, Q5a-Q5i, Q6, Q7, Q8 and Q9 were significant with p-values below 0.05. This means that these items were correlated to the English PSQI Score. Item Q5j was not significant because this item inquired about other reasons for the participant's sleep disturbance which is also answerable by a 4-point Likert scale of frequency. From our data, item Q2 was not significant when measured as an independent factor. It needs a factor associated with it for it to be significant, which is item Q5a. Q2 asks how long in minutes the participant usually fall asleep each night and Q5a asks how frequent the participant cannot get to sleep within 30 minutes. Items Q2 and Q5a constitute the sleep latency component of the PSQI. Overall, as measured by the Goodness of fit, it showed that the items in the Filipino version of the questionnaire are directly correlated with English PSQI score, indicating that the questionnaire is valid.

In conclusion, the results of this study demonstrated that the Filipino version of the PSQI is a valid and reliable instrument to assess sleep quality, being comparable to its original version when applied to subjects who speak Filipino. The questionnaire may now be used by clinicians for preliminary evaluation of sleep health among Filipinos especially in those areas that have limited access to sleep studies. The tool could help clinicians identify patients who may require further testing for sleep disorders and eventually refer them to sleep specialists. Moreover, the questionnaire is self-administered and can be understood by the majority in the country. The instrument may also be used as a standardized tool for future clinical researches and epidemiological studies conducted in the Filipino-speaking population.

In addition, based on this study, we found out that majority of the participants have poor sleep quality. "Poor sleepers" especially those with higher scores may be advised to undergo further sleep assessment. A large number in this group showed poor results in sleep efficiency and sleep disturbances components of the PQSI. We also recommend that future studies which focus on evaluation of these two components may be warranted.

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