

Reliability and Validity of Simplified Chinese STOP-BANG Questionnaire in Diagnosing and Screening Obstructive Sleep Apnea Hypopnea Syndrome

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Summary: The main purpose of this study was to assess the reliability and validity of the simplified Chinese STOP-BANG Questionnaire (SBQ) as a diagnosing and screening tool for obstructive sleep apnea hypopnea syndrome (OSAHS). Two hundred and ten patients with suspected OSAHS were recruited in this study. The simplified Chinese SBQ was completed twice before and after polysomnography (PSG) monitoring. SPSS 20.0 was used to analyze the test-retest reliability, discriminant validity, comparative validity and predictive validity of the SBQ. Fourteen patients were excluded on account of fragmentary data, and valid 196 were divided into four groups: non-OSAHS group ($n=28$, 14.29%), mild OSAHS group ($n=28$, 14.29%), moderate OSAHS group ($n=31$, 15.81%) and severe OSAHS group ($n=109$, 55.61%). The test-retest coefficient for the first four items was 0.810, 0.679, 0.775, 0.963 respectively and the total score of the STOP questionnaire was 0.854. The analysis of discriminant validity revealed that there were significant differences among four groups in the total score of the SBQ and scores of item 1, 3, 7 and 8, which were also validated between patients with normal blood oxygen saturation and different degrees of hypoxemia. The SBQ evaluation showed low consistency with diagnostic gold standard PSG ($\kappa=0.303$, $P<0.05$). When taking apnea hypopnea index (AHI) $\geq 5/h$, $\geq 15/h$ and $\geq 30/h$ as cut-offs to evaluate the SBQ predictive value, the areas under ROC curve were 0.77, 0.81 and 0.78, the sensitivity was 90.48%, 93.57% and 93.33%, and corresponding negative predictive values were 40.74%, 66.67% and 85.19%, respectively. It was suggested that the simplified Chinese version of SBQ had good reliability, and could distinguish the severity of OSAHS. Despite its limited diagnostic accuracy, the SBQ can be considered as an ideal tool for screening OSAHS with superior predictive validity.

Key words: STOP-BANG questionnaire; polysomnography; obstructive sleep apnea-hypopnea syndrome; screening

Obstructive sleep apnea hypopnea syndrome (OSAHS) is characterized by apnea or hypopnea induced by recurrent upper airway collapse and obstruction during sleep, manifested with snoring, recurrent blood oxygen saturation decrease, arousals from sleep and excessive daytime sleepiness. The disorder affects overall quality of life, and is associated with hypertension, cardiovascular events, cerebrovascular diseases, and metabolic disorders^[1-5].

OSAHS is a relatively common disorder. The estimated prevalence of OSAHS ranges from 2% to

16% in Chinese adults, depending on the geographic region and study methodology, and even reaches up to 20%–40% among the people over the age of 60 years^[6-10]. Although overnight polysomnography (PSG) is internationally recognized as the gold standard for diagnosing the presence and severity of OSAHS, which is expensive and time-consuming, some patients are reluctant to undergo PSG monitoring, therefore OSAHS remains largely underdiagnosed and undertreated in clinical settings. Therefore, it is momentous to screen out patients at high-risk of OSAHS by a simple and reliable method for further PSG monitoring.

In an effort to deal with this issue, researchers have developed a variety of clinical prediction models

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and questionnaires, in which the STOP-BANG questionnaire (SBQ) is a recently proposed model^[11,12]. The SBQ is a self-administered eight-item questionnaire which was developed by Chung *et al* and its effect on OSAHS screening during the perioperative patients was validated^[13]. With Chung's permission, domestic scholars introduced and translated it into simplified Chinese. Then they made preliminary studies on the SBQ in Chinese population and confirmed that the SBQ played a significant role in OSAHS screening^[14-19]. Nevertheless, there is no strict and systematic research on the reliability and validity of the simplified Chinese version of SBQ up to now. This study was designed to evaluate the reliability and validity of simplified Chinese version of the SBQ for identifying OSAHS.

1 MATERIALS AND METHODS

1.1 Study Population

The study was conducted in the Sleep Center of Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology during the period from March 2014 to April 2015. The study protocol was approved by the Research and Ethics Committee of Tongji Medical College and written informed consent was obtained from all participants. Patients who were aged over 18, referred to the Sleep Center with clinically suspected OSAHS, and were going to

undergo overnight PSG monitoring were enrolled.

Patients had to meet the following criteria: (1) aged over 18; (2) be literate (could read and write); (3) independent behavioral ability and cognitive ability. The exclusion criteria included: illiteracy; a history of sleep-breathing disorder due to brain tumors, epilepsy, Parkinson's disease or other central neural system diseases; a history of severe mental diseases; chronic anxiolytic or sedative drug use; chronic alcoholic; previously diagnosed and treated OSAHS.

1.2 STOP-BANG Questionnaire

The SBQ contains 8 dichotomous clinical questions related to snoring (S), tiredness (T), observed apnea (O), blood pressure (P), body mass index (BMI, B), age (A), neck circumference (N) and gender (G) (table 1). With a score of 1 for "yes", a score of 0 for "no", and the total score ranges from 0 to 8. The STOP questionnaire (the first four items of the SBQ) was completed by the patients themselves. Professional technicians in the Sleep Center measured the height, weight and neck circumference and completed the last four items of the SBQ (BANG). Information of SBQ was collected for the first time prior to PSG monitoring. For test-retest analysis, our technicians conducted telephone survey in all patients to acquire the answer to the first four items of SBQ (STOP questionnaire) again at a time interval of 14–21 days. A total score of 3 or more was considered to be at high risk of OSAHS.

Table 1 STOP-BANG questionnaire

Item	Questions	Answers	
1	Snoring: do you snore loudly (louder than talking or loud enough to be heard through closed doors)?	Yes	No
2	Tired: do you often feel tired, fatigued, or sleepy during daytime?	Yes	No
3	Observed: has anyone observed you stop breathing during your sleep?	Yes	No
4	Blood pressure: do you have or are you being treated for blood pressure?	Yes	No
5	BMI: BMI more than 35 kg/m ² ?	Yes	No
6	Age: age over 50 years old?	Yes	No
7	Neck circumference: neck circumference greater than 40 cm?	Yes	No
8	Gender: gender male?	Yes	No

1.3 Polysomnography

After the questionnaires were finished, overnight PSG was performed using the Alice 5 Sleep Monitoring System. All sleep-affecting drugs were prohibited before monitoring. The electroencephalogram, electrocardiogram, electromyogram (submental and bilateral anterior tibialis), snoring, chest and abdominal respiratory efforts, body position, oronasal airflow and pulse oxygen saturation were monitored during sleep. A standard PSG report records the percentage of longest apnea time, arousal index, sleep efficiency, apnea hypopnea index (AHI), the lowest pulse blood saturation (LSpO₂) and sleep stages. AHI was defined as the sum of apneas and hypopneas per hour of sleep. The diagnosis and severity of OSAHS was classified

based on the AHI value with obstructive events: 5–15/h as mild, 15–30/h as moderate, ≥30/h as severe^[20]. Hypoxemia was categorized by the LSpO₂ at night: 85%–90% as mild, 65%–85% as moderate, <65% as severe. The non-OSAHS patients were regarded as AHI <5/h. The physicians in our Sleep Center who carried out the PSG examinations were blinded to the SBQ scores.

1.4 Statistical Analysis

Statistical analyses were performed by SPSS 20.0. Means and standard deviations (mean±SD) were used to describe the quantitative variable and comparisons were done using one-way ANOVA. Besides, non-normally distributed continuous data were represented by median and inter-quartile range (IQR). Frequencies

and percentages (*n*; %) were calculated to describe categorical variables. The correlation coefficient (*r*) was used to evaluate test-retest reliability, and coefficient with value >0.7 was considered acceptable. Kruskal-Wallis ANOVA on ranks was applied to estimate the discriminant validity of the SBQ. The relationship between items of SBQ and AHI was analyzed by Pearson correlation analysis and simple linear regression. Sensitivities, specificities, positive predictive values and negative predictive values were adopted to analyze the predictive ability of the SBQ. The receiver operating characteristics (ROC) curves and the areas under the curve (AUC) were adopted at all three AHI cut-off values of 5, 15 and 30 respectively. A value of *P*<0.05 was considered statistically significant.

2 RESULTS

2.1 Clinical Data

Two hundred and ten patients were recruited in this study: 14 patients were excluded due to fragmentary data, and 196 patients were included in the final analysis, all of whom were Chinese. Taking AHI greater than 5/h as cut-off point for diagnosis of OSAHS, 168 patients (85.71%) were defined as OSAHS, including 28 cases of mild (14.29%), 31 cases of moderate (15.81%), and 109 cases of severe (55.61%) OSAHS. Similarly, there were 38 (19.39%), 74 (37.76%), and 59 (30.10%) patients who had mild, moderate and severe night hypoxemia, respectively. There were 35 women and 161 men, with ages ranging from 18 to 70 years old. The average BMI was 27.23±4.03 kg/m². The average neck circumference was 40.41±3.70 cm. The first scores of the SBQ were 4.19±1.52, and the median AHI was 35.55/h with the range of 0–120/h.

The distribution of SBQ scores is shown in fig. 1. The SBQ score of 3, 4, 5 and 6 had higher frequencies of patients (15.38%, 24.10%, 25.64% and 14.87%, respectively). The age, gender, BMI, neck circumference and AHI of patients in different groups are shown in table 2. There were significant differences among the four groups in gender, BMI, neck circumference and AHI. The distribution of each item answered “Yes” in the simplified Chinese version of SBQ in each group is presented in table 3.

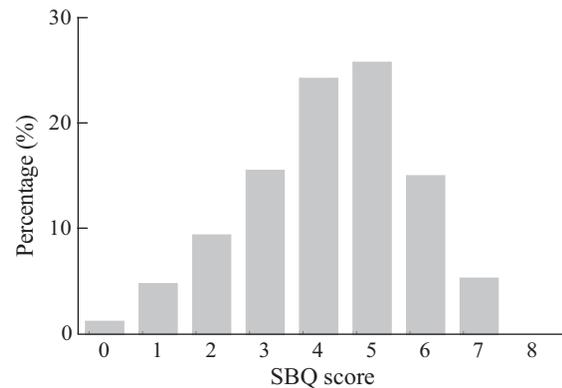


Fig. 1 Distribution of SBQ scores

2.2 Test-retest Reliability

All the 196 patients answered the STOP questionnaire twice at a time interval of 14–21 days, and 151 patients (77.4%) got the same scores. The values of test-retest correlation coefficient (*r*) for the scores of the four items were 0.810, 0.679, 0.775 and 0.963 respectively, with a correlation coefficient of 0.854 for the total score of STOP (*P*<0.01, fig. 2).

2.3 Discriminant Validity

Table 4 shows the scores (median and IQR)

Table 2 Characteristics of patients between different groups

Characteristics	Non-OSAHS	Mild OSAHS	Moderate OSAHS	Severe OSAHS	<i>F</i> / χ^2 value	<i>P</i> -value
Number (%)	28 (14.29%)	28 (14.29%)	31 (15.81%)	109 (55.61%)	-	-
Gender (M/F)	18/10	20/8	25/6	98/11	12.81	0.005
Age (years)	40.29±10.96	44.57±10.70	45.00±10.60	42.26±10.40	1.34	2.264
BMI (kg/m ²)	24.40±2.86	24.34±2.52	26.18±3.55	28.84±3.88	20.62	<0.001
Neck circumference (cm)	37.38±2.90	38.16±3.06	39.40±2.63	42.00±3.41	23.85	<0.001
AHI	2.67±1.47	9.49±2.58	21.81±4.59	62.01±18.93	159.56	<0.001

Table 3 Distribution of each item answer “yes” in the simplified Chinese version of SBQ

SBQ items	Non-OSAHS <i>n</i> (%)	Mild OSAHS <i>n</i> (%)	Moderate OSAHS <i>n</i> (%)	Severe OSAHS <i>n</i> (%)	Total <i>n</i> (%)
1	18 (9.20%)	21 (10.71%)	30 (15.31%)	105 (54.08%)	175 (89.29%)
2	15 (7.65%)	13 (6.63%)	19 (9.69%)	85 (43.37%)	132 (67.35%)
3	11 (5.61%)	13 (6.63%)	22 (11.22%)	95 (48.47%)	141 (71.94%)
4	4 (2.04%)	8 (4.08%)	9 (4.59%)	35 (17.86%)	56 (28.57%)
5	0	1 (0.51%)	1 (0.51%)	6 (3.06%)	8 (4.08%)
6	5 (2.55%)	7 (3.57%)	9 (4.59%)	22 (11.22%)	43 (21.94%)
7	8 (4.08%)	6 (3.06%)	12 (6.12%)	79 (40.31%)	105 (53.57%)
8	18 (9.18%)	20 (10.20%)	25 (12.76%)	99 (50.51%)	162 (82.65%)

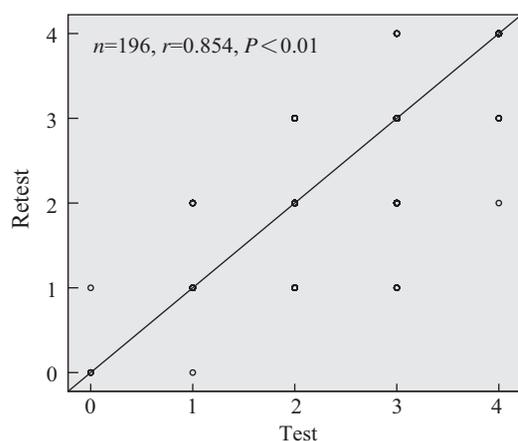


Fig. 2 Scatter plot of STOP questionnaire by test-retest correlation analysis ($n=196$)

of the SBQ for all eight items in OSAHS groups and non-OSAHS group. There were significant differences among four groups in the total scores, item 1 (Snoring), item 2 (Tired), item 3 (Observed), item 7 (Neck circumference) and item 8 (Gender). Item 4 (Blood pressure) ($P=0.327$), item 5 (BMI >35 kg/

m^2) ($P=0.610$) and item 6 (Age >50 years) ($P=0.677$) had no statistically significant difference among four groups. Similarly, there was significant difference in the total scores, item 1, 3, 7 and 8 among groups at LSpO₂ (table 5). The total scores of the SBQ were correlated positively with AHI ($r=0.554$, $P<0.01$), and negatively with LSpO₂ ($r=-0.453$, $P<0.01$).

2.4 Comparative Validity

According to the PSG recordings, there were 28 (14.29%) patients in non-OSAHS group and 168 (85.71%) patients in OSAHS groups. A total score of 3 or more was considered at high risk of OSAHS and less than 3 was considered at low risk of OSAHS. By the SBQ, 169 (86.22%) patients were considered at high risk of OSAHS and 27 (13.78%) patients at low risk of OSAHS. 152 patients in OSAHS groups had the SBQ total scores of 3 or more, while 11 patients in non-OSAHS groups had the SBQ total scores less than 3. McNemar test and Kappa test showed a poor consistency and significant difference at diagnosing OSAHS between the SBQ and gold standard PSG (χ^2 value 15.48, $P<0.01$, kappa value 0.303).

Table 4 Discriminant validity of the SBQ for non-OSAHS patients and OSAHS patients

Items	Non-OSAHS ($n=28$)	Mild OSAHS ($n=28$)	Moderate OSAHS ($n=31$)	Severe OSAHS ($n=109$)	χ^2 value	P value
Total score	3.00 [1.25, 4.00]	3.00 [2.25, 4.00]	4.00 [3.00, 5.00]	5.00 [4.00, 6.00]	54.94	<0.001
Item 1	1.00 [0.00, 1.00]	1.00 [0.25, 1.00]	1.00 [1.00, 1.00]	1.00 [1.00, 1.00]	33.14	<0.001
Item 2	1.00 [0.00, 1.00]	0.00 [0.00, 1.00]	1.00 [0.00, 1.00]	1.00 [1.00, 1.00]	14.04	<0.001
Item 3	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	1.00 [0.00, 1.00]	1.00 [1.00, 1.00]	36.15	<0.001
Item 4	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	3.46	0.327
Item 5	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	1.82	0.610
Item 6	0.00 [0.00, 0.00]	0.00 [0.00, 0.75]	0.00 [0.00, 1.00]	0.00 [0.00, 0.00]	1.53	0.677
Item 7	0.00 [0.00, 1.00]	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	1.00 [0.00, 1.00]	36.89	<0.001
Item 8	1.00 [0.00, 1.00]	1.00 [0.00, 1.00]	1.00 [1.00, 1.00]	1.00 [1.00, 1.00]	14.14	0.003

Table 5 Discriminant validity of the SBQ for normal blood oxygen and hypoxemia

Items	Non-hypoxemia ($n=25$)	Mild hypoxemia ($n=38$)	Moderate hypoxemia ($n=74$)	Severe hypoxemia ($n=59$)	χ^2 value	P value
Total score	2.00 [1.00, 4.00]	3.00 [3.00, 4.00]	5.00 [4.00, 5.00]	5.00 [4.00, 6.00]	51.55	<0.001
Item 1	1.00 [0.00, 1.00]	1.00 [1.00, 1.00]	1.00 [1.00, 1.00]	1.00 [1.00, 1.00]	38.06	<0.001
Item 2	1.00 [0.00, 1.00]	1.00 [0.00, 1.00]	1.00 [0.00, 1.00]	1.00 [1.00, 1.00]	3.93	0.270
Item 3	0.00 [0.00, 1.00]	1.00 [0.00, 1.00]	1.00 [0.75, 1.00]	1.00 [1.00, 1.00]	28.26	<0.001
Item 4	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	2.89	0.410
Item 5	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	4.86	0.182
Item 6	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 0.00]	7.22	0.065
Item 7	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	1.00 [0.00, 1.00]	1.00 [1.00, 1.00]	43.72	<0.001
Item 8	1.00 [0.00, 1.00]	1.00 [0.00, 1.00]	1.00 [1.00, 1.00]	1.00 [1.00, 1.00]	17.87	<0.001

2.5 Predictive Validity

Table 6 presents the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) for the SBQ at different cut-off values (AHI $\geq 5/h$, 15/h and 30/h). Using the SBQ to predict all OSAHS, moderate/severe OSAHS and severe OSAHS, the AUC were 0.77, 0.81 and 0.78, respectively (fig. 3).

Table 6 The predictive parameters of the SBQ for OSAHS identification at different AHI cut-off values

Predictive index	AHI ≥ 5	AHI ≥ 15	AHI ≥ 30
Sensitivity	90.48%	93.57%	96.33%
Specificity	39.29%	32.14%	26.44%
PPV	89.94%	77.51%	62.13%
NPV	40.74%	66.67%	85.19%
AUC	0.77	0.81	0.78

3 DISCUSSION

In recent years, due to its convenience, efficiency and high sensitivity, the SBQ has been widely applied and validated in surgical patients, the general population, pregnant patients, bus drivers, and patients with renal failure^[21–25]. In this study, we assessed the reliability and validity of the simplified Chinese version of the SBQ.

In the test-retest analysis, 151 participants (77.4%) remained equal scores in the first and second surveys with test-retest correlation coefficient of 0.854, in which coefficients for the item 1 to 4 ranged from 0.679 to 0.963. As well-known, r value of 0.8 or more indicates good agreement between test and retest, and our result supports the simplified Chinese version of the SBQ got sufficient test-retest reliability. In a study of Professor Chung's original English version of the questionnaire, 55 patients answered to STOP questionnaire twice and 53 (96.4%) patients of them had the same scores between the two surveys and the test-retest coefficient was 0.923^[26]. The value of the reliability coefficient in our study was slightly lower than that of the English version, which might be due to different survey manners by which the questionnaire was completed between the test and retest.

Using Kruskal-Wallis ANOVA on ranks to estimate discriminant value, our results showed statistical difference among the four groups in total score of the SBQ, which indicated good discriminant validity. Each item in the SBQ was validated equally, but predictive value of each appeared differently^[13]. We found that there were significant differences among the four groups in score of item 1 (Snoring), item 2 (Tired), item 3 (Observed), item 7 (Neck circumference) and 8 (Gender). In another word, these items were independent predictors for OSAHS screening and could predict OSAHS and differentiate the severity of OSAHS. Previous studies supported

that OSAHS was correlated closely with age, obesity, gender and hypertension^[1, 27–29]. To make better use of the SBQ, Chung *et al* did an in-depth investigation and concluded that male gender was a more significant predictive factor than age and neck circumference for patients with STOP score ≥ 2 ^[30].

But as noted, item 4 (Blood pressure), item 5 (BMI >35 kg/m²) and item 6 (Age >50 years) in our study did not differ significantly among the four groups. Actually, previous studies have reported and confirmed that blood pressure, BMI and age had intimate association with OSAHS^[28, 29, 31–33]. The discrepancy between their findings and our findings is likely due to the difference in the study population. The original English version of the questionnaire designed by Professor Chung *et al* was given to preoperative clinic patients, who have received complete physical examination, while the patients in our study were all recruited from the Sleep Center, some of whom had never taken health checkup and might not be aware of their own physical condition, let alone the treatment of hypertension^[13]. The cut-off of BMI (>35 kg/m²) in the original version was formulated according to the European and American criteria, while in China BMI greater than 28 kg/m² was diagnosed as obesity. The BMI in only 8 (4.08%) of the patients in our study was above 35 kg/m², and the mean of BMI in each group was below 35 kg/m². It is only in severe OSAHS group that the mean of BMI was over 28 kg/m². Even though item 5 (BMI >35 kg/m²) did not show perfect discriminant validity, BMI had a positive correlation with AHI and increased with the severity of the disease ($r=0.563$, $P<0.001$), which indicates that the BMI index was a meaningful predictor for OSAHS screening. It is maybe necessary to readjust the cut-off of BMI for updated simplified Chinese Version in the future work. As regards age, in our study the mean value of age was only 42 years old, far below the cut-off of 50 years, while the average age in Chung's study was 57 years. Much lower age of the population may

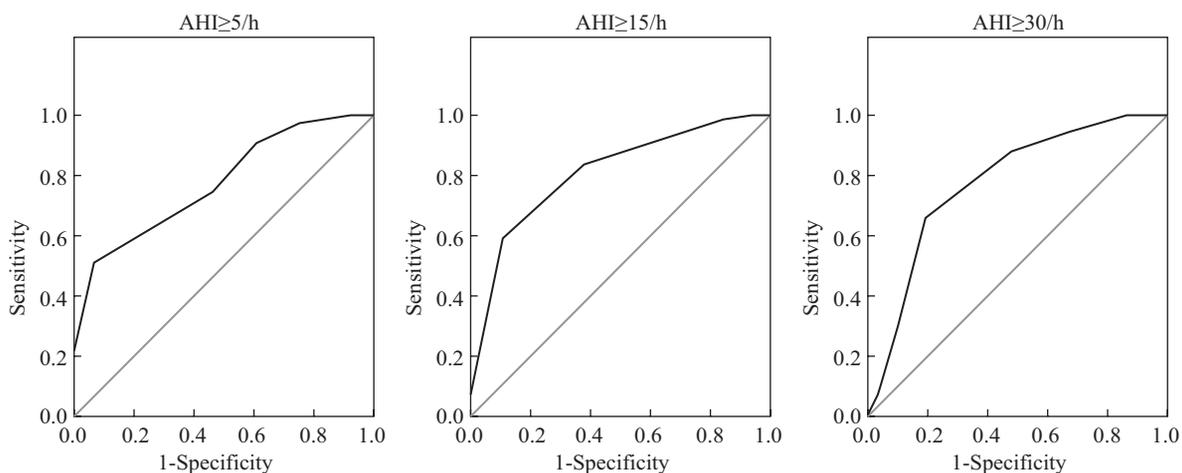


Fig. 3 ROC curves with the AHI cut-off $\geq 5/h$, $15/h$ and $\geq 30/h$ for the simplified Chinese version of the SBQ

contribute to poor discriminant validity.

The association between the SBQ and the probability of OSAHS plays a significant role in OSAHS screening. As a diagnostic tool, it should provide crucial information to rule in or rule out patients for unrecognized OSAHS and triage patients for diagnosis and further treatment. In this study, we found that the SBQ diagnostic evaluation had low consistency with gold standard PSG. The coincidence degree of the two diagnostic methods is 0.303, which is lower than the criterion of good consistency (0.75). Differences between output of PSG and the SBQ indicate that it is unreliable to distinguish OSAHS patients only with the cut-off of SBQ score ≥ 3 . That is to say, the SBQ alone is inadequate to rule out the need for a sleep study in all patients.

The SBQ has been widely studied and validated in various populations as a screening tool^[13, 34]. A study conducted by Ong *et al* found that the sensitivities of the SBQ with AHI greater than 5/h, 15/h, 30/h as cut-offs were 84.7%, 91.0%, 95.4%, respectively; the specificities were 52.6%, 40.4%, 35.0%, respectively; even if BMI is greater than 30 kg/m², the predictive validity is unchanged^[35]. Chung *et al* confirmed the superior value of the SBQ in preoperative patients^[26]. Coelho *et al* showed that it also has a higher sensitivity in screening for AHI more than 15/h in the general population^[36]. The study by Pataka *et al* verified that compared with STOP questionnaire, Berlin questionnaire, Epworth Sleepiness scale and four-variable screening tool, the SBQ had the highest sensitivity, the lowest specificity and the maximum under the ROC curve^[37]. Similar to those previous studies^[15, 35], our study showed that the sensitivity values of the SBQ were 90.48%, 93.57% and 96.33% with AHI $\geq 5/h$, 15/h, and 30/h, the negative predictive values were 40.74%, 66.67% and 85.19%, and AUC were 0.77, 0.81 and 0.78, respectively.

The present study confirmed that the SBQ had excellent sensitivity and negative predictive value with the cut-off of SBQ total score ≥ 3 . High sensitivity means that the questionnaire has excellent screening characteristics and it is considered to be very helpful to distinguish OSAHS patients, especially for moderate and severe OSAHS who is more urgent for further diagnosis and intervention. Higher negative predictive value suggests that patients who are considered to be at low risk of OSAHS by the SBQ are less likely to suffer from OSAHS. The largest AUC was shown for the simplified Chinese version of the SBQ at a cut-off value of AHI $\geq 15/h$, which is similar to the original English version validated in Chung's study, suggesting the highest ability in predicting moderate and severe OSAHS^[13].

As a limitation, our study was conducted in the snoring clinic center where the prevalence of OSAHS

was higher than general population. The discriminant validity of the SBQ may be affected by socio-economic and demographic differences, especially as seen in items 5 and 7. It may be necessary to re-set the BMI and neck circumference threshold in the Simplified Chinese version of the SBQ in future research work to better adapt to Chinese population. Although, a cut-off value of SBQ total score ≥ 3 provides a high sensitivity for detecting sleep apnea, clinicians still need to properly classify patients for further PSG monitoring.

In conclusion, the simplified Chinese version of SBQ has good reliability, and can discriminate the severity of OSAHS. Despite its limited diagnostic accuracy, the SBQ can be considered as an ideal tool for screening OSAHS with superior predictive validity.

Conflict of Interest Statement

The authors of this paper declare they have no conflict of interest.

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