

# Validation of the Chinese Version of the Patient's Communication Perceived Self-efficacy Scale (PCSS) in Out Patients after Total Hip Replacement

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## Research article

**Keywords:** Communication, self-efficacy, total hip replacement, validation

**Posted Date:** November 19th, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-78784/v1>

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# Abstract

**Background:** Among older patients worldwide, communication has become an important public health issue in the world. This communication could be improved by different interventions. However, a tool of measuring patients' confidence in communication with doctors has not been established in China. This study is aimed at translating and introducing the Patient's Communication Self-Efficacy Scale for assessing communication between doctors and elderly patients.

**Method:** (1) A post-consultation questionnaire was completed by 167 patients (mean age = 70.04 years; SD: 6.3 years; females/males: 94/73). The researchers translated the English version PCSS into Chinese under the guidance of the original author. (2) The final Chinese version of the PCSS was validated. Measurement indices included item generation, reliability testing, construct validity and test-retest reliability. To carry out the above tests, we used SPSS 19.0 software and LISREL 8.7. We built the Bayesian network model of the Chinese version of the PCSS and determined predictive variables.

**Result:** Confirmatory factor analysis showed that the Chinese version of the PCSS fit a three-dimensional model. Additionally, the Chinese version of the PCSS has high internal consistency (Cronbach's  $\alpha$  coefficient 0.929) and test-retest reliability (Kappa coefficient 0.761). The Bayesian networks shows that the important predictors are education (0.4207), PEPPI 3 (0.3951), and PCSS 1 (0.1139). The connections between PCSS 3 and other variables do not indicate causality but rather conditional dependencies or interrelatedness.

**Conclusion:** This is the first study to validate the Chinese version of the PCSS in outpatients after total hip replacement. Our results confirmed that the Chinese version of the scale has high internal consistency, construct validity and test-retest reliability. Patient-doctor interaction and education are important predictors of patient communication self-efficacy.

## Background

Communication with others is an important part of a person's life. It is necessary for social activities, such as working and learning, and for carrying out simple and routine tasks requiring a simple and direct exchange of information<sup>[1]</sup>. As we know, the communication between doctor and patient is not always balanced, and the doctor has the power to dominate the whole conversation, such that the patient plays a passive role, which leads to some obstruction of communication<sup>[2]</sup>. Patient-doctor communication is central to the process of health education. Research on conflict between doctors and patients overseas involves social role theory, doctor-patient exchange theory, asymmetric information theory and the health care system<sup>[3]</sup>. In most industrialized countries, the main trend in health care is to pay increasing attention to the interests, needs and attributes of patients. Patients are increasingly viewed as the main actors in doctor-patient interactions and influential actors in the health care system in order to help clinicians provide health services which is consistent with the needs, points and preferences of patients and allow patients to provide input and participate in health care decision-making activities<sup>[4, 5]</sup>.

Self-efficacy describes the individual's belief that he/she is capable of performing a certain task and producing a desired effect: it reflects the person's perceptions of their capability to perform specific tasks and is distinct from their actual ability. It is closely related to the expected result of one's action. An analysis of the literature shows that self-efficacy is a valuable and important factor in predicting behavior in clinical, academic and employment environments. According to Bandura's social cognitive theory, self-efficacy has an important impact on individuals' behavior<sup>[6]</sup>. Greater self-efficacy has been shown to improve outcomes and function in a variety of geriatric conditions. Studies highlighted that after cardiac surgery, a high level of self-efficacy is conducive to rehabilitation and has a beneficial impact on personal function and well-being<sup>[7]</sup>. Patients' communication beliefs and active participation in medical experiences have been proven to better control main symptoms, improve patients' satisfaction for experience in clinical, and reduce medical errors<sup>[8]</sup>.

Total hip replacement is effective in reducing pain and improving function and quality of life for individuals with osteoarthritis or other joint diseases<sup>[9, 10]</sup>. In Sweden, more than 30,000 total hip and knee replacements are performed annually, almost 60% in women, with an average age at surgery of approximately 68 years<sup>[11]</sup>. According to Kurtz SM<sup>[12]</sup> and other researchers, the number of hip replacements will increase by 174% by 2030. In 2014, the number of total hip replacements in China was close to 240,000 cases. With the popularization of standardized surgical techniques and the increase in patients' acceptance of surgery, the total volume of hip replacements is expected to continue to grow at an increasing rate<sup>[13]</sup>.

A literature review of patients' experiences in health care concluded that it was necessary to develop and test a new questionnaire for related studies<sup>[14]</sup>. For a long time, there was a lack of fully validated tools for use in the outpatient hospital care setting, especially to assess patients' self-efficacy on communication. The Patient's Communication Perceived Self-Efficacy Scale (PCSS) was developed by Capone and Petrillo to measure outpatients' confidence in their ability to successfully master situations involving communication with doctors<sup>[15]</sup>. The scale is composed of 16 items and has a three-factor structure of self-efficacy, which included "Provide and Collect information," "Express concerns and doubts," and "Verify information," tapping the second factor, defined as patient communication self-efficacy. The results of the construction and validation study showed that the PCSS is a simple, valid and reliable measurement that can be used to assess patients' communication self-efficacy<sup>[15]</sup>. In China, research on the confidence of patients' communication is in its infancy and, to the best of our knowledge, no questionnaire is available for the measurement of outpatients' communication self-efficacy with doctors.

To date, the validity and reliability of the original version PCSS have been confirmed in multiple populations<sup>[15]</sup>. The aim of this study was to test the structural validity and reliability and build Bayesian network modeling of the Chinese version Patient's Communication Perceived Self-Efficacy Scale in outpatients following total hip replacement.

We expect to confirm the correlated three-factor structure of as found in the original study (Provide and Collect information," "Express concerns and doubts," and "Verify information") and show that a higher-order latent factor for communication self-efficacy can be validated.

## Method

### Design

This is observational research that utilized the cross-sectional survey method and was divided into two steps: (1) translation of the English version of the PCSS into Chinese and (2) validation of the Chinese version of the PCSS in outpatients following total hip replacement between June and August in 2020.

### Data collection

Based on the requirements for confirmatory factor analysis (CFA), we needed enough outpatients post-total hip replacement to complete this survey<sup>[16]</sup>. The participants did not have known cognitive impairments or reading problems.

### Sample size

The sample-to-item ratio should be above 5:1. In practice, the ideal ratio often achieves 10:1<sup>[17]</sup>. In this study, the number of samples met the ideal conditions. According to Chinese law, ethical approval was indicated for this study.

## Participants

### Patients

The Hospital Research Ethics Committee approved the study protocol, and patients provided informed consent before participation. At the beginning of this research, the respondents were informed about the related rights and obligations to participants. The researchers used uniform language to explain the main points of this survey. All questionnaires were independently completed by outpatients. The privacy of the participants was protected for the entire duration of the study. A survey was conducted between June and August 2020, involving outpatients who underwent total hip replacement in the orthopedic trauma department. We randomly selected patients in the database.

The inclusion criteria were as follows: (1) outpatients status post unilateral primary total hip replacement who had no complications; (2) conscious and had comprehension ability sufficiently; (3) age > 60 years old; (4) Barthel Index<sup>[18]</sup> (BI) > 60; and (5) written informed consent before the survey.

The exclusion criteria were as follows: (1) nervous system diseases; and (2) inability to communicate with others, such as deafness and aphasia.

According to the Chinese law, Tianjin Hospital Medical Ethics Committee gave approval for this research (TJYY-2020-YLS-043).

The survey was self-administered. The researchers explained the aim of this study, participants' rights and obligations and obtained consent from the participants prior. Participants' privacy was protected for the entire duration of the study, and the participants must be complete the scales in 10 minutes. Finishing the first survey, participants were asked if they were willing to join the second (administered at approximately two weeks) and the third (administered at approximately two months) surveys later.

## Translation of the Chinese version of the PCSS

The original English version of the PCSS comprises 16 items. The original version of the PCSS was published in English<sup>[15]</sup>. In the original version of the PCSS, all items were measured by a 5-point scale, from 1 (not at all confident) to 5 (completely confident). Higher scores reflect better self-efficacy on communication. The scale started with the following: "Think about the encounter you just had with your doctor. . .mark to what extent you feel capable of doing the following things"<sup>[15]</sup>. According to Bandura's suggestions<sup>[19]</sup>, the initial guidance is to establish an appropriate mentality, which the patient should have when assessing their beliefs about their communication ability. Patients were then asked to judge their ability to act, not their potential<sup>[16]</sup>. Each item of the original version PCSS was translated into the initial Chinese version by two researchers respectively who have medical education backgrounds. Then, the initial version was translated back to English by two other researchers and reviewed by one of the original authors. The final Chinese version of the PCSS comprises 16 items and measures confidence in communication with doctors with the 5 Likert scale from 1 = "not at all confident" to 5 = "completely confident".

## Other scale for validation

The perceived efficacy of patient-physician interactions questionnaire (PEPPI-10) is used to measure patients' self-efficacy in communicating with health-care professionals such as doctors or nurses<sup>[20]</sup>. There are two versions of the original PEPPI: 10-items scale and 5-items scale. They are all the 11 Likert scale (between 0 = no confidence and 10 = very high confidence). Higher score indicates that the individual has a better ability for patient-physician interaction. The Cronbach's  $\alpha$  coefficient of the original version PEPPI-10 is 0.91, which demonstrates a reliable theoretical basis in study. Meanwhile, the Chinese version PEPPI-10 has good validity and reliability in people with knee osteoarthritis<sup>[21]</sup>.

## Statistical analysis

SPSS 19.0 software (IBM, 2010) and LISREL 8.7 (Science and software international, Lincoln wood, IL, USA) were used for statistical analysis. After collecting the questionnaires, we analyzed the missing data and frequency of the scales. Then, we performed confirmatory factor analysis (CFA) to test the structural validity using LISREL 8.70. Then, we checked the distribution characteristics of scores from the Chinese version of the PCSS, tested the normality of the total score and determined the possible lower and upper limit effects, evaluating whether more than 15% of the participants scored the worst or best on the Chinese version PCSS, which represented the lower and upper limit effects [22]. CFA was used to test whether scoring of the Chinese version of the PCSS was suitable for three-factor modeling. In addition, the nonstandard fitting index (NNFI), comparative fitting index (CFI) and standard root mean square residual (SRMR) were used to assess the model fit. NNFI and CFI values  $\geq 0.90$  and SRMR values  $\leq 0.08$  were considered sufficient model fit [23,24]. In this study, we used Cronbach's  $\alpha$  coefficient to examine the internal consistency of the Chinese version of the PCSS. Cronbach's  $\alpha$  coefficient represents the average split half reliability coefficient of all items, which is the most common effectiveness measurement index in validation studies [25]. The Cronbach's  $\alpha$  coefficient score ranges from 0 to 1, with 0 meaning that there is no correlation of the items in the scale and 1 meaning complete correlation of all items in the scale. Many studies have proven that Cronbach's  $\alpha$  coefficient is a reliable index for measuring the internal consistency of a scale [26]. When the Cronbach's  $\alpha$  coefficient exceeds 0.7, the scale has good internal consistency and can be used in clinical research [27]. Cohen's kappa was used to calculate the test-retest reliability in the validated study. The value of Cohen's kappa has been used to examine the level of test-retested consistency [28]:  $< 0$  represents inconsistency; 0.0-0.20 represents slight consistency; 0.21-0.40 represents fair agreement; 0.41-0.60 represents moderate agreement; 0.61-0.80 represents basically consistent; and 0.81-1.0 represents completely consistent.

We used the Bayesian network function of SPSS Modeler 18.0. This neural network builds the model by learning the potential correlation between the independent variable (the third score of the Chinese version of the PCSS) and the dependent variable. Then, the model results are verified by comparing the predicted values with the actual values. In such applications, the neural network system is better than the traditional computer, which solves the problem according to a set of instructions [29,30].

## Results

### Participants

Of the 175 participants recruited in the first investigation, 8 were excluded because of missing items in the Chinese version of the PCSS, leaving 167 for analysis of structural validity. The clinical characteristics and the demographic of the participants are shown in Table 1. The median (IQR) score of the participants on the Chinese version PCSS was 57 (8). Six patients were lost to follow-up in the second and third follow-ups. Hence, 161 patients were included in the test-retest reliability and Bayesian networks analyses.

Table 1  
Sample characteristics (N = 167)

| Characteristics   | Median (IQR) or number |
|---|------------------------|
| Age, years  | 72(8)                  |
| Sex,male  | 73                     |
| Ethnicity, Han nationality  | 159                    |
| Housing status  |                        |
| Living alone  | 48                     |
| Living with spouse or grown children  | 119                    |
| Education <sup>a</sup>  |                        |
| Low   | 41                     |
| Medium  | 98                     |
| High  | 28                     |
| PCSS (range, 16–80)   | 57(8)                  |
| PEPPI (range,0–100)   | 78(27)                 |
| Notes: <sup>a</sup> low = none, primary school, lower-level vocational training, lower-level secondary general education; medium = middle-level vocational training, higher-level secondary general education; high = higher-level vocational training, academic education. |                        |
| Abbreviations: PEPPI-10, Perceived Efficacy Patient-Physician Interactions Scale ; PCSS, Patient's Communication Perceived Self-efficacy Scale  |                        |

## Structural validity and internal consistency

In our study, the results showed that the Chinese version of the PCSS has good fit indices for three-factor modeling by confirmatory factor analysis (CFA) (SRMR = 0.073, NNFI = 0.90, CFI = 0.992), with the exception of the root mean square error of approximation. Standardized factor loading ranged from 0.59 for item 5 to 0.87 for item 2 (Fig. 1). The results showed that the Cronbach's  $\alpha$  coefficient of the Chinese version PCSS was 0.929 with higher internal consistency. Consequently, the results of this research showed that the Chinese version PCSS fits three dimensions (Goodness of Fit Index (GFI) = 0.80).

## Test-retest reliability

In this study, we analyzed the test-retest reliability of the Chinese version of the PCSS in outpatients following total hip replacement. Six cases were excluded after being lost to follow-up, leaving 161 cases for analysis of test-retest reliability of the Chinese version of the PCSS. The substantial kappa coefficient is 0.761 (Table 2) in the test-retest reliability of the Chinese version PCSS, which was above the cutoff point for group-level comparisons. Therefore, we carried out a Bland-Altman analysis, which confirmed that the limits of agreement between the two surveys were rather narrow, ranging from - 7.6 to 7.2 (Fig. 2).

Table 2  
Symmetry measure of the Chinese version PCSS

|   |       | Value | Asymptotic standard error <sup>a</sup> | Approximation $T^b$ | <i>P</i> |
|---|-------|-------|--|---------------------|----------|
| Coherence measure   | Kappa | 0.761 | 0.035                                  | 38.491              | 0.000    |
| Effective cases   | N     | 161   |  |                     |          |
| <sup>a</sup> No assumption of zero                                    |       |       |  |                     |          |
| <sup>b</sup> Assuming zero hypothesis using asymptotic standard error |       |       |  |                     |          |

## Bayesian Networks

First, we assigned values to the main variables before building the Bayesian networks (Table 3). Analysis using Bayesian networks confirms that the important predictors are education (0.4207), the score of PEPPI on the third administration (PEPPI 3) (0.3951), and the score of PCSS on the first administration (PCSS 1) (0.1139). The connections between the PCSS score at the third time point (PCSS 3) and other variables do not indicate causality but rather conditional dependencies or interrelatedness (Fig. 3).

Table 3  
The main variables and assignments

| Variable  | Assignment method  |
|---|--|
| 1.Score   |  |
| PEPPI 1, PEPPI 2, PEPPI3  | PEPPI:1 = 0 ~ 50,2 = 51 ~ 75,3 = 76 ~ 100  |
| PCSS 1, PCSS 2, PCSS 3  | PCSS:1 = 16 ~ 48,2 = 49 ~ 64,3 = 65 ~ 80   |
| 2.Sex   | 1 = Female,2 = Male  |
| 3.Age   | 1 = 60 ~ 70,2 = 71 ~ 80,3 = 80~  |
| 4.Housing status  | 1 = living alone,2 = living with spouse or grown children  |
| 5.Education   | 1 = none, primary school, lower-level vocational training, lower-level secondary general education;<br>2 = middle-level vocational training, higher-level secondary general education;<br>3 = higher-level vocational training, academic certification |
| Abbreviations:  |  |
| PEPPI 1: the first time point of Perceived Efficacy Patient-Physician Interactions Scale; |  |
| PEPPI 2:the second time point of Perceived Efficacy Patient-Physician Interactions Scale; |  |
| PEPPI 3:the third time point of Perceived Efficacy Patient-Physician Interactions Scale;  |  |
| PCSS 1: the first time point of Patient’s Communication Perceived Self-efficacy Scale;    |  |
| PCSS 2: the second time point of Patient’s Communication Perceived Self-efficacy Scale;   |  |
| PCSS 3: the third time point of Patient’s Communication Perceived Self-efficacy Scale     |  |

In summary, we show that behavioral habits such as education and the ability to interact with physicians make a significant contribution to the incidence of communication with doctors. People with higher education and good ability to interact with health care workers are more likely to have good confidence in communication with doctors. In comparing various data mining techniques, many researchers found that in a biased data set, only the Bayesian network model worked well because the majority of the predictors in the project were categorical<sup>[31]</sup>.

## Discussion

Our study thoroughly measures the validity and reliability of the Chinese version of the PCSS in outpatients following total hip replacement. The findings of this study indicate that the Chinese version of the PCSS is valid and reliable enough to assess the characteristics of and confidence in communication with doctors or nurses in outpatients status post total hip replacement. The Chinese

version of the PCSS can be used as an assessment tool for assessing communication in outpatients after total hip replacement because the questionnaire is simple and has good validity and reliability.

We found that the Chinese version of the PCSS fits a three-dimensional construct by confirmatory factor analysis. These factors offer a context-specific and patient-centered means of examining perceived ability related to important roles patients are expected to fulfill in medical encounters. Many studies have confirmed that CFA is a powerful test method in terms of structural validity<sup>[32]</sup>. In our research, the results confirmed that the model of the Chinese version of the PCSS was adequately consistent with the clinical sample data. The results of most fitting indexes are suitable for the three-dimensional construct, but we are unable to explain why the findings are above/below the recommended cutoff. However, the results of the Chinese version of the PCSS showed high internal consistency, indicating that all items measure the same concept. In cross-cultural research, Cronbach's  $\alpha$  efficiency was the same as that reported in the original validation study. Therefore, we believe that the scale has sufficient precision for individualized clinical evaluation.

Test-retest reliability is an important part of cross-cultural studies on evaluation tools. Higher test-retest reliability can demonstrate high value for application in clinical studies<sup>[28]</sup>. Measures of the internal consistency and test-retest reliability of the Chinese version of the PCSS all exceeded 0.7, which is reported to indicate that the assessment tool is sufficiently reliable on clinical researches. The kappa coefficient was 0.761 in the test-retest reliability study, indicating substantial agreement between the two investigations. Meanwhile, the Bland-Altman analysis showed that the predominant source of error was not significant. Because two weeks as the survey period is used in our research, which might cause inter-individual variation.

Meanwhile, this study showed that the Bayesian network model can work well in a biased data set because a large number of predictor variables are categorical. The results of Bayesian network analysis showed that the important predictors are education, PEPPI3, and PCSS1. The connections between the PCSS3 and other variables do not indicate causality but rather conditional dependencies or interrelatedness.

Through this study, we believe that our conclusions support the validity and reliability of the Chinese version of the PCSS in outpatients following total hip replacement.

The results may be less persuasive because of the small number of participants. Because the number of participants is not larger, the positioning accuracy of all items in the scale must be sufficient<sup>[19]</sup>. Since the Chinese version of the PCSS has been clearly targeted, the requirements for the sample value have been reduced and vice versa. Therefore, these arguments cannot challenge the effectiveness of the Chinese version of the PCSS.

Based on the results of this study, future research goals are (1) to evaluate the scale's sensitivity, (2) to evaluate the Chinese version of the PCSS in other clinical samples, and (3) to generate an electronic scale.

## Conclusion

Our study confirmed that the Chinese version of the PCSS has good construct validity and test-retest reliability. The Chinese version of the PCSS can be used in clinical research to test individuals' self-efficacy on communication with doctors. It is easy to implement and possesses measurement accuracy. The PCSS can help health-care providers measure the communication self-efficacy of outpatients after total hip replacement. Hence, it could be useful for determining patients' level of communication self-efficacy, allowing for design the specific interventions.

Validation is a continuous process, further research will measure other psychometric properties, especially sensitivity. Therefore, the validation of a Chinese version of this scale is of interest for research in China as well as for cross-cultural research, making cross-cultural comparisons possible.

## Declarations

### Ethics approval and consent to participate

The current study was approved by the Institutional Ethical Review Board of Tianjin Hospital (No. TJYY-2020-YLS-043) and was conducted in accordance with the Ethical Guidelines for Epidemiological Research by the Chinese Government. All study participants provided written informed consent by completion and submission of the survey.

### Consent to publish

Not applicable.

### Availability of data and materials

The datasets generated and analyzed for the current study are not publicly available because the Ethical Guidelines for Epidemiological Research by the Chinese Government prohibit researchers from providing their research data to other third-party individuals.

### Competing interests

The authors declare that they have no competing interests.

### Funding

This study was supported by Tianjin Academy of Nursing (TAN) Grant-in-Aid for Scientific Research (No: tjhlky2020YB01; PI: Miss Huiwen Zhao).

# Author contribution

Huiwen Zhao received research approval from Tianjin Hospital. Wen Luo received authorization to use the PCSS in Chinese/China from V Capone. Wen Luo, Jing Liu and Jing Wang translated the PCSS into Chinese; Wen Luo and V Capone revised the back-translated scale. Jing Liu, Ziyi Li and Jing Wang performed data collection from participants and data analysis. Wen Luo and Huiwen Zhao wrote the manuscript advised by V Capone.

# Acknowledgments

This is a cross-cultural study, and the original version of the PCSS has been published by Pro. Vincenza Capone on in Patient Education and Counseling. The Chinese version of the PCSS has not been published previously.

Capone V, Petrillo G. Patient's Communication Perceived Self-efficacy Scale (PCSS): construction and validation of a new measure in a socio-cognitive perspective. *Patient Educ Couns*, 2014;95: 340-347.

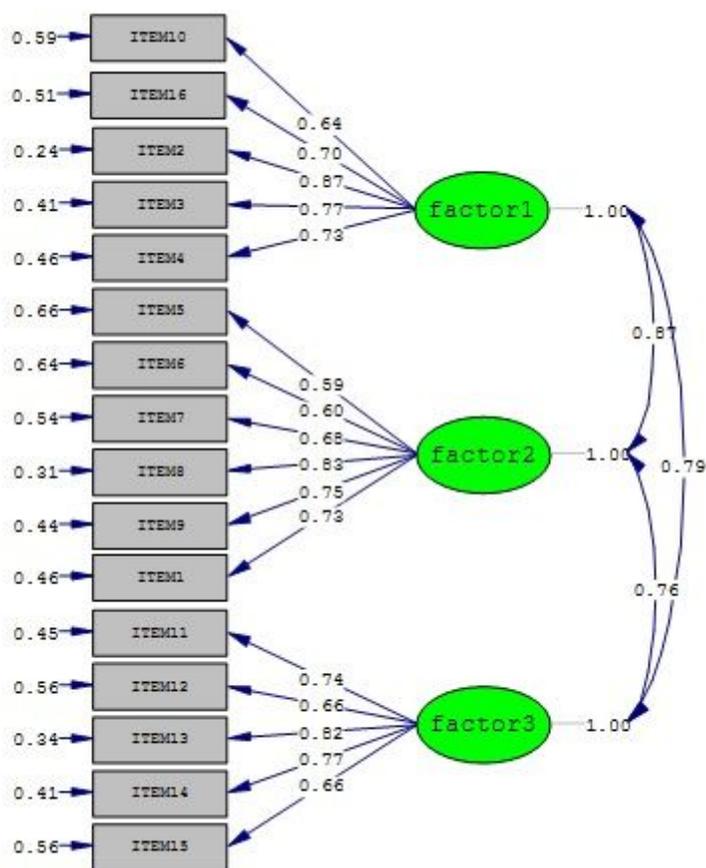
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## Figures



**Figure 1**

Standardized factor loading and residuals for the items of the PCSS.

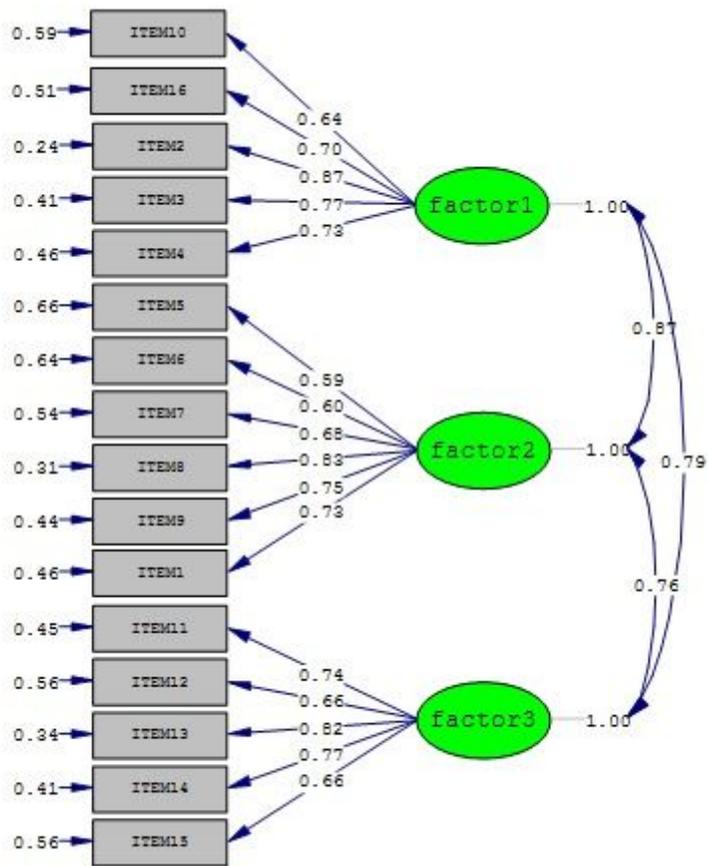
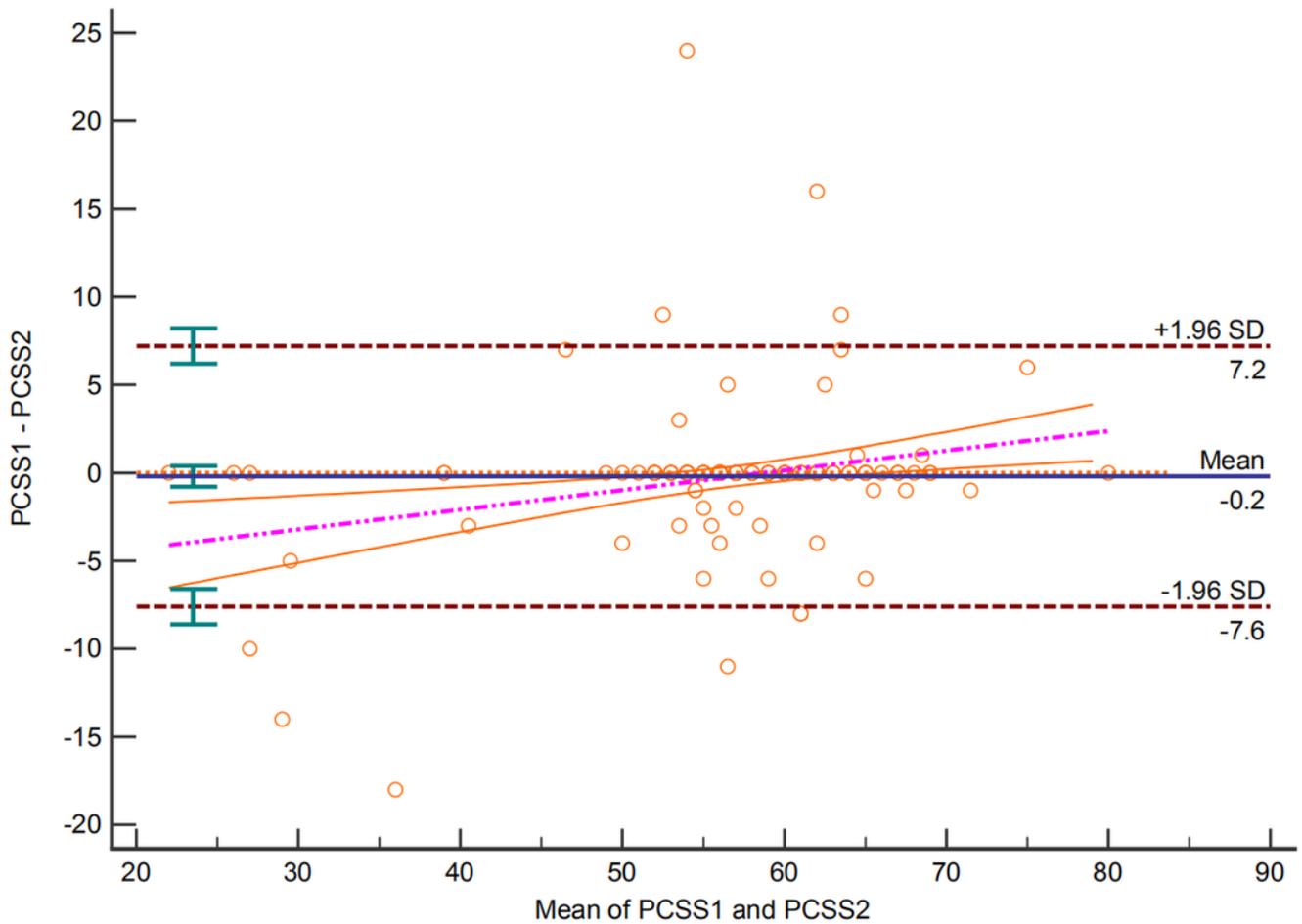


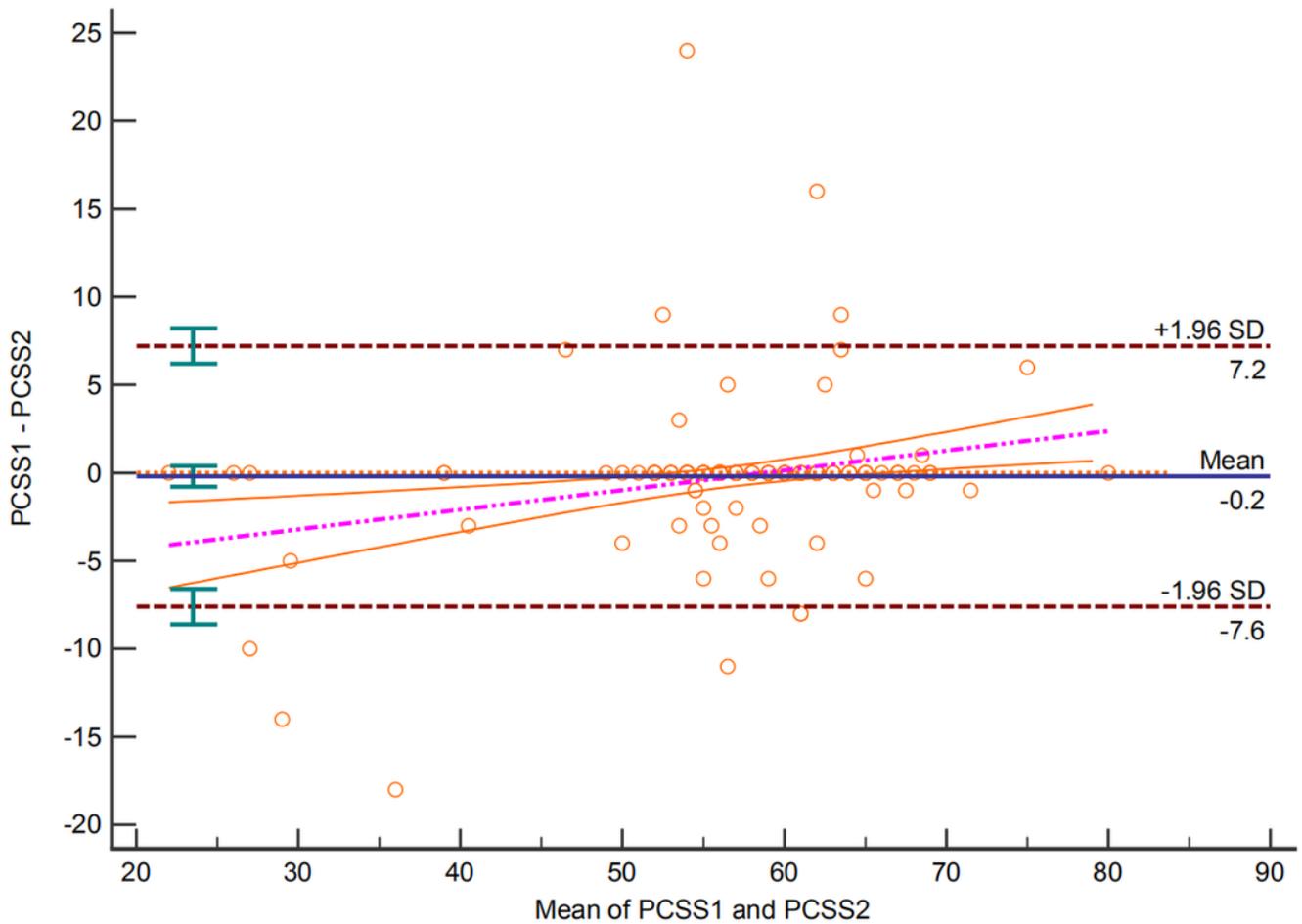
Figure 1

Standardized factor loading and residuals for the items of the PCSS.



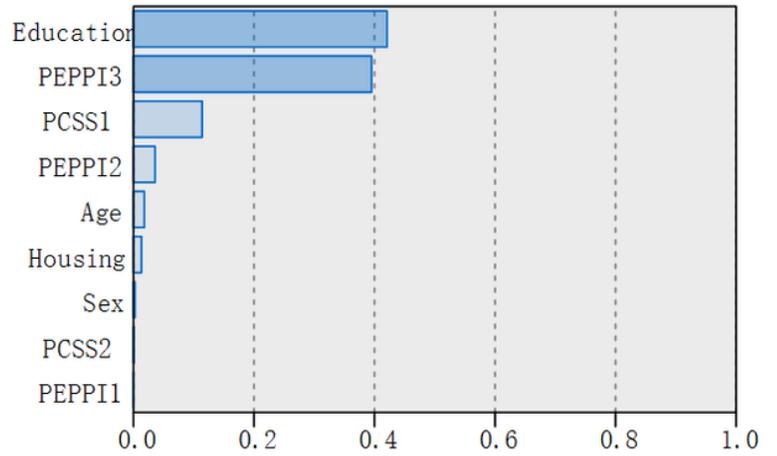
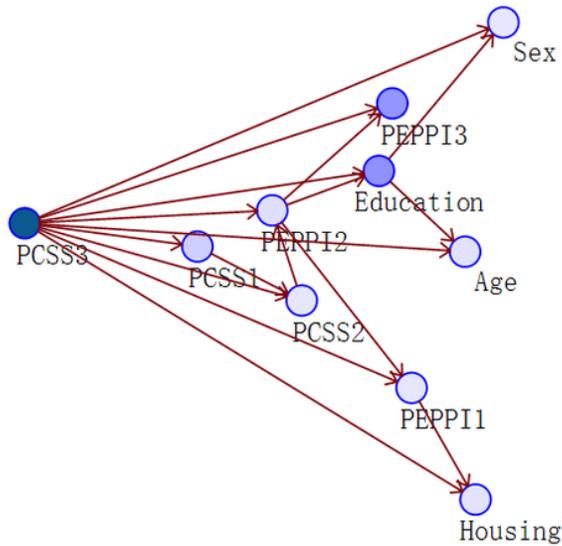
**Figure 2**

Individual agreement between test and retest scores of the Chinese version PCSS. The horizontal solid line represents the mean difference between both scores. The dashed line represents the linear regression line through the data points. The outer dashed lines represent the 95% limits of agreement (mean difference  $\pm$  1.96 SD of the difference).



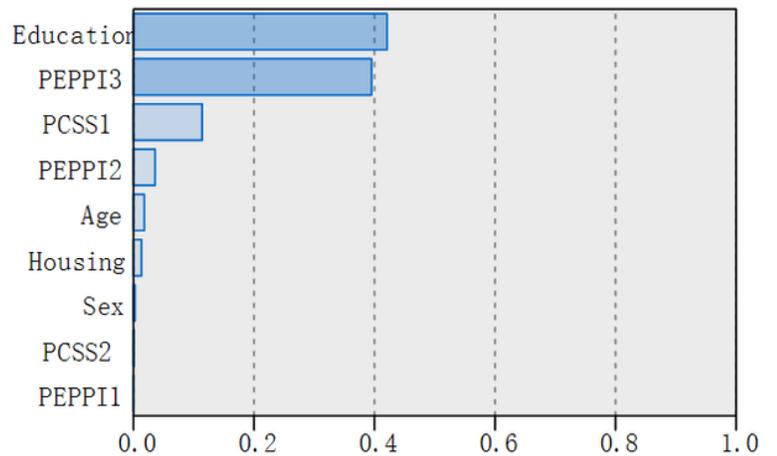
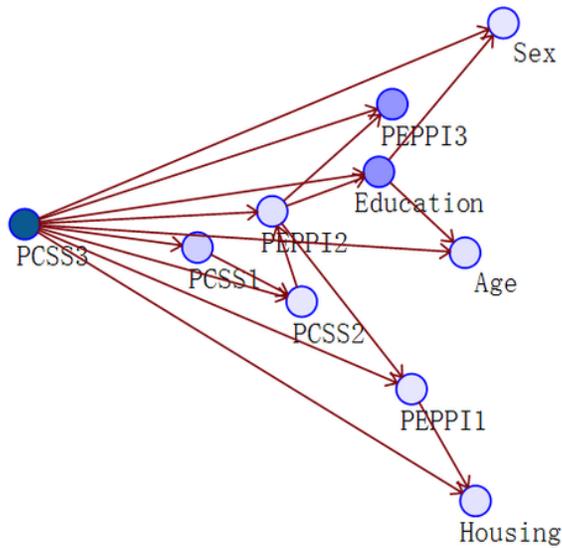
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**Figure 3**

Bayesian Networks: Model summary and predictor importance



**Figure 3**

Bayesian Networks: Model summary and predictor importance

## Supplementary Files

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