Current Medical Science
DOI https://doi.org/10.1007/s11596-019-2090-7
39(4):670-678,2019

Development and Validation of a Simplified Chinese Version of the Assessment Tool for Students' Perceptions of Medical Professionalism

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Summary: Professionalism is crucial in all professions and is particularly important in the medical field. Measuring students' perceptions of professionalism can help to form education targeting the enhancement of professionalism. This study aimed to validate an effective assessment tool for the measurement of medical students' perceptions of medical professionalism in mainland China. The cross-sectional survey was conducted in three medical colleges in Guangdong, China. Of the 2103 eligible medical students, 1976 responded, and 1856 questionnaires were deemed valid. Students from clinical medicine in these three medical colleges were randomly selected by cluster sampling. First, a Simplified Chinese Version questionnaire to measure Student's Perception of Medical Professionalism (SCV-SPMP) was constructed. Second, questionnaires from 1856 students majoring in clinical medicine at three medical colleges were included in the analysis. Third, exploratory factor analysis, Cronbach's alpha, item-subscale correlation, and confirmatory factor analysis were conducted to test the validity and reliability of the SCV-SPMP. Nine items were eliminated following exploratory factor analysis, and four subscales were extracted from the analysis. All internal consistency reliability exceeded the minimum standard. The overall Cronbach's alpha was 0.94, and four subscales' alphas were 0.82 (Accountability and excellence), 0.81 (Duty), 0.89 (Honor and integrity), and 0.85 (Practice habits and respect for others), respectively. The model fit was good. The convergent validity and discriminant validity were acceptable. The modified SCV-SPMP was found to be a valid and reliable tool to capture the main features of Chinese students' perceptions of medical professionalism in four dimensions, and it provides a quantitative method for the measurement of the students' perceptions in mainland China. .
Key words: medical professionalism; validation; assessment tool; medical student; perception

Medical professionalism is one of the key competencies for physicians, and the training in professionalism starts in an early phase of each physician's career path—undergraduate medical education[1]. This indicates that medical educators are responsible for delivering clear and correct guidelines for professionalism to their students[2]. The fundamental underlying assumption is that professionalism in students helps them become professional physicians. Studies have indicated that a lack of professionalism in undergraduate education is associated with disciplinary actions being taken by medical boards[3–5]. Thus, medical educators should stress professionalism, since education on that topic has always been insufficient in China[6]. Also, research shows that the evaluation of students' perceptions about professionalism is critical for the development of courses designed to enhance professional behaviors[7]. Therefore, understanding perceptions about professionalism in the early phase of medical education has become essential, since its results can provide evidence for adjustments to be made during the education process[8].

To develop a good measurement of professionalism, researchers have first attempted to define this multidimensional concept[9–11]. The American Board of Internal Medicine (ABIM) Foundation proposed several elements of medical professionalism, including altruism, accountability, excellence, duty, service, honor, integrity, and respect for others[12]. In 2002, the ABIM Foundation, the American College of Physicians-American Society of Internal Medicine, and the European Federation of Internal Medicine jointly released a Physician Charter[13]. This Charter

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elucidated three fundamental principles incorporating the primacy of patient welfare, patient autonomy, and social justice and identified a set of responsibilities of professionalism to which physicians were requested to adhere in medical practice. These two aforementioned theories have formed the foundation for most of the existing researches about professionalism.

Tsai *el al* developed a reliable medical professionalism questionnaire with subscale reliability ranging from 0.66 to 0.86 to measure students' perceptions based on the ABIM framework[14], which is also the theoretical basis for the construction of Blackall's and Al-Eraky's questionnaire[7, 15]. However, the reliability of the latter two was not good. The Physician Charter also served as the basis for the designation of specific scales as in two research projects conducted, respectively, in Korea and Europe[16, 17], but the validity and reliability of those questionnaires have not been tested. Wang *el al*[18], in China, developed a professionalism assessment tool which achieved good reliability. However, it originated from three other scales and lacked sufficient theoretical support. Still other scales originated from unknown domains and were not sufficiently convincing[19, 20].

Due to the complexity of this concept, current measurement tools for medical professionalism differ in their contexts and objectives, in cognitive levels and behavioral outcomes[21–25]. In terms of studies on the assessment of professionalism, more emphases have been placed on behaviors rather than on cognitive characteristics and attitudes[26], indicating the insufficiency of measurement tools for the assessment of perceptions of professionalism. Thus, it is important to devote a study to examine students' perceptions of professionalism, to fill in the gaps in current research[8, 11, 27].

Previous studies have shown that cultural background is a factor that helps determine how people value medical professionalism[28, 29]. For example, compared with students from Western backgrounds, those from a Chinese cultural background place more emphasis on morality and the integration of social and personal roles[30]. Interest in the study of professionalism in the Chinese context has involved three areas: first, the definition of medical professionalism in China; second, the conflicts of interests (between physicians and stakeholders in the industry); and third, the intense relationship between physicians and patients[31]. For instance, Leung *et al* attempted to explore the perceptions of medical professionalism by interviewing health workers in Hong Kong based on 30 primary themes[32]. Pan *et al* constructed a framework for healthcare providers in China using the nominal group technique[33]. These studies focused on detecting the most-well-accepted concepts of medical professionalism against a Chinese cultural background, instead of assessing healthcare providers' perceptions of medical professionalism.

Until now, no universally acceptable standard has been established for measuring Chinese medical students' perceptions of professionalism. Without a clear outline of perceptions about professionalism against a Chinese cultural background, it is difficult to assess whether current curricula are helpful in accomplishing the teaching aims. The purpose of this study was, first, to modify a Simplified Chinese Version Self-assessment tool to measure Student's Perception on Medical Professionalism (that is, the SCV-SPMP), and, second, to assess the validity and reliability of this tool.

1 MATERIALS AND METHODS

1.1 Instrument Development

We adopted Tsai's medical professionalism questionnaire because it showed good reliability and validity[14]. Further, Taiwan and mainland China are rooted in a similar traditional Chinese cultural background. Tsai's version of the SPMP was originated from the definition of the American Board of Internal Medicine and was developed to measure the respondents' subjective perceptions about medical professionalism[14]. In Tsai's scale, 32 items with response options based on a 5-point Likert scale (very important=5, not important at all=1) were used to measure professionalism according to the ABIM definition. The items represented eight dimensions: altruism, accountability, excellence, duty, service, honor, integrity, and respect for others.

In this study, the translation and adaptation of the SCV-SPMP questionnaire involved several steps. First, after the permission for translation was obtained, we translated Tsai's original scale from traditional Chinese to a simplified Chinese version[14]. Second, native traditional Chinese users (fluent in reading simplified Chinese) verified the translation. Third, two experts in this academic field reviewed the questionnaire. The questionnaire also collected students' basic characteristics, which could be influential or confounding factors in medical students' perceptions of professionalism, including gender, date of birth, grade, and program duration. Then, a pilot test of the questionnaire, as the provisional version of the SCV-SPMP, was further administered to 45 additional medical students to estimate the comprehensibility of each item. In the pilot test, the questionnaire could be completed in under 15 min. The wording of items was adjusted after the pilot study in order to be more comprehensible. Subsequently, the first version of the SCV-SPMP was completed.

In this stage, the SCV-SPMP consisted of two parts. The first part included a 32-item scale, and the

second included some questions about the participants' personal information (demographics).

1.2 Data Collection and Data Entry

Three medical colleges, owned by different levels of government in China (central, provincial, and city government), were selected since they had different management patterns, and the admission scores of these three colleges on the Chinese College Entry Exam varied significantly (National College Student Information Center)[34]. The former education and socioeconomic backgrounds of those students in different medical colleges, therefore, might vary as well. The students majoring in clinical medicine were chosen. Finally, cluster sampling was conducted. All grades were included, and classes or intern groups in each grade were randomly selected. All students from the same selected classes or intern groups were surveyed.

The sample size formula for psychometric surveys was used[35]. A typical conservative estimate was made in case the data were sufficient. A 15% refusal rate and 10% of invalid questionnaires were estimated to adjust the sample size. Finally, the ideal sample size of 1840 was set.

Data collection began in March 2013 and lasted for 4 months. Postgraduate students were instructed to administer the process of questionnaire distribution and collection. The students were aware of the study goals and consented to participate. Before completing the questionnaire, they were instructed not to identify themselves. All questionnaires collected were given a number, and then we conducted a consistency check, logical check, and double-entry input, in order to control the quality of data entry. This research was approved by the Ethical Review Committee of School of Public Health, Sun Yat-sen University, on May 20, 2011 (approval number: SPH2011-029).

1.3 Statistical Analyses

Statistical analyses consisted of a description of the participants and validation of the SCV-SPMP scale. SPSS 19.0 and AMOS 19.0 for Windows were used for data analysis, and missing item scores were imputed with the mean score of that participant.

First, the social-demographic characteristics of the participants were described. Second, validation of the SCV-SPMP scale was tested. Exploratory factor analysis was used for construct validity. The item selection process was: eigenvalue higher than 1.0, factor loading over 0.50, and no retained item with secondary loading over 0.50. For internal consistency reliability, Cronbach's alpha (α) for the overall scale and each subscale was calculated. Also, item-subscale correlation was calculated for reliability. Cronbach's alpha over 0.70 was recommended for adequacy of reliability coefficients[36–38]. The item-subscale correlation was considered acceptable if over 0.50. Next, confirmatory factor analysis including the selected items was conducted with AMOS 19.0 to test the fitness of our theory model. Construct validity was assessed by Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Non-Normed Fit Index (NNFI), Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA; <0.05) and Standardized Root Mean Square Residual (SRMR; <0.08)[39]. Then, we calculated the value of average variance extracted (AVE) to test the convergent validity, which was considering acceptable if the value of AVE was higher than 0.50. Discriminant validity was decided by comparison of the subscale's value of the square root of AVE with the correlation coefficients of the specific subscale with those of other subscales[40]. Finally, we used the analysis of variance (ANOVA) and *t* tests, respectively, to compare the levels of perceptions among the three different medical colleges and between five-year and eight-year programs.

2 RESULTS

2.1 Responding Groups

Study participants included 2103 medical students from three medical colleges. A total of 1976 (94%) responded after checking the basic information and the scale, and 120 were excluded because of missing main information (such as age and gender) or incompletion of the scale (did not give a valid score on more than 3 items). To make maximum use of the data, those missing one or two items on the scale (49 questionnaires) were included in statistical analyses, and the missing value was imputed with the mean score of the participant. As a result, 1856 questionnaires were included in statistical analyses. The characteristics of participants are described in table 1.

Table 1 Characteristics of valid respondents (*n*=1865)

Category	*n*	%
Gender		
Male	905	48.8
Female	951	51.2
Age (year)		
<21	569	30.7
21–23	886	47.7
>23	306	16.5
Missing	95	5.1
Management level of medical college		
Ministerial	1094	58.9
Provincial	353	19.0
Municipal	409	22.0
Medical college		
Medical college 1	1094	58.9
Medical college 2	409	22.0
Medical college 3	353	19.0
Type of program		
Five-year program	1449	78.1
Eight-year program	407	21.9

2.2 Exploratory Factor Analysis

As a test of the validity of the scale, exploratory factor analysis was conducted with the Varimax factor rotation. Table 2 shows the results. Components with eigenvalue larger than one were extracted as subscales. Four components were extracted, accounting for 59.91% of the total variance. Items with low factor loading (<0.5) on all subscales and items with similar factor loading on more than one subscale were deleted. Nine of the 32 items were excluded based on the criteria of factor analysis. Thus, the final version of the SVC-SPMP included 23 items.

Table 3 presents the final 23 items on the SCV-SPMP. The mean score varied from 3.04 (Enduring unavoidable risks to oneself when a patient's welfare is at stake) to 4.56 (Being accountable to their patients for fulfilling the implied contract governing the patient/physician relationship) on the 5-point Likert scale. The overall Cronbach's alpha was 0.94, and the four subscale alphas were 0.82 (Accountability and excellence), 0.81 (Duty), 0.89 (Honor and integrity), and 0.85 (Practice habits and respect for others), indicating an excellent internal consistency reliability.

Table 4 presents the Pearson correlation coefficients between each item and the four subscales extracted. The results showed that each item was strongly associated with its corresponding scale, with values ranging from 0.64 (Being accountable to their patients for fulfilling the implied contract governing the patient/physician relationship) to 0.88 (Accepting inconvenience to meet the needs of one's patients).

Table 5 presents the results of confirmatory factor analysis. In our adjusted model, both RMSEA and SRMR were lower than 0.08, while Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Non-Normed Fit Index (NNFI), and Comparative Fit Index (CFI) were higher than 0.9, indicating acceptable construct validity.

2.3 Convergent and Discriminant Validity

Table 6 shows the value of AVE of each subscale, the square root of every AVE value belonging to each subscale, and correlation coefficients between subscales. Except for subscale 3, the values of AVE of the other three subscales were higher than 0.50, showing suitable convergent validity. For subscales 1 and 4, the square root of AVE was higher than any other correlation coefficients, indicating acceptable discriminant validity.

Table 2 Exploratory factor analysis with Varimax factor rotation

Items	Subscale 1	Subscale 2	Subscale 3	Subscale 4
Volunteering one's skills and expertise for the welfare of the community	0.58			
Being fair	0.75			
Being truthful, keeping one's word	0.77			
Meeting commitments, dedication	0.71			
Recognition of the possibility of conflict of interest and avoidance of relationships that allow personal gain to supersede the best interest of the patient	0.69			
Caring, compassion, empathy	0.71			
The refusal to violate one's personal and professional codes	0.66			
Dress properly		0.73		
Address, decorum, and etiquette		0.66		
Their work discipline		0.63		
Respect patients and their families, commitment to patient confidentiality		0.58		
Respect other physicians and professional colleagues such as nurses, medical students, residents, and subspecialty fellows		0.63		
Being culture sensitive		0.64		
Being accountable to their patients for fulfilling the implied contract governing the patient/physician relationship			0.53	
Being accountable to their profession for adhering to medicine's time-honored ethical precepts			0.60	
A conscientious effort to exceed ordinary expectations			0.64	
A conscientious effort to make a commitment to life-long learning			0.66	
Being capable to provide best health care			0.67	
Masterly communications and expression, being able to listen			0.56	
Awareness of own limitations			0.52	
Being available and responsive when "on call"				0.69
Accepting inconvenience to meet the needs of one's patients				0.77
Enduring unavoidable risks to oneself when a patient's welfare is at stake				0.79
Eigenvalue	4.53	3.34	3.21	2.69
Variance (%)	19.71	14.53	13.95	11.71
Accumulative variance (%)	19.71	34, 24	48.19	59.91

Table 3 Descriptive data of the final 23 items on the SCV-SPMP scale

Items	Mean	SD	Cronbach's α
Subscale 1 (Honor and integrity)			0.89
Volunteering one's skills and expertise for the welfare of the community	4.01	0.98	
Being fair	4.25	0.93	
Being truthful, keeping one's word	4.36	0.88	
Meeting commitments, dedication	4.08	1.03	
Recognition of the possibility of conflict of interest and avoidance of relationships that allow personal gain to supersede the best interest of the patient	4.15	1.02	
Caring, compassion, empathy	4.26	0.95	
The refusal to violate one's personal and professional codes	4.5	0.81	
Subscale 2 (Practice habits and respect for others)			0.85
Dress properly	3.69	1.11	
Address, decorum, and etiquette	3.93	0.99	
Their work discipline	4.41	0.8	
Respect patients and their families, commitment to patient confidentiality	4.48	0.79	
Respect other physicians and professional colleagues such as nurses, medical students, residents, and subspecialty fellows	4.37	0.81	
Being culture sensitive	3.84	1.15	
Subscale 3 (Accountability and excellence)			0.82
Being accountable to their patients for fulfilling the implied contract governing the patient/physician relationship	4.56	0.74	
Being accountable to their profession for adhering to medicine's time-honored ethical precepts	4.45	0.8	
A conscientious effort to exceed ordinary expectations	3.75	1.05	
A conscientious effort to make a commitment to life-long learning	4.18	0.94	
Being capable to provide best health care	4.05	0.91	
Masterly communications and expression, being able to listen	4.33	0.85	
Awareness of own limitations	4.23	0.9	
Subscale 4 (Duty)			0.81
Being available and responsive when "on call"	3.48	1.18	
Accepting inconvenience to meet the needs of one's patients	3.31	1.26	
Enduring unavoidable risks to oneself when a patient's welfare is at stake	3.04	1.5	

2.4 Comparison among Medical Colleges and between Programs

Table 7 shows the mean scores of the three different medical colleges and two different programs. For the three medical colleges, the overall scores for perceptions of professionalism among these students were relatively high in general, but the mean scores of subscale 4 were particularly lower than those of other subscales. For the overall scale and all subscales, medical college 1 showed the lowest mean scores. Except for subscale 4, there were no significant differences between medical colleges 2 and 3. However, it can be seen that medical college 1 differed significantly from medical college 2 in subscales 1, 3, and the overall scale. Further, medical college 1 was distinct from medical college 3 in subscale 4 and the overall scale. Differences between the five-year and eight-year programs appeared only in subscale 4.

3 DISCUSSION

The SCV-SPMP scale introduced in this article is an explicit adaptation of the original students' perceptions of professionalism scale, a Taiwan cultural-based scale for medical students. The final version of the SCV-SPMP scale is comprised of 23 items measuring 4 dimensions, and the items remaining in the SCV-SPMP showed high consistency with the original scale. A standard evaluation process was followed to validate the SCV-SPMP. Thus, the results we produced were convincing, showing that the hypothesized scales had achieved good reliability and validity. Exploratory factor analysis supported the construct validity of the SCV-SPMP scale, and the four factors extracted (named as four subscales in this article) explained 59.91% of the total variance. High item-subscale (over 0.6) correlation and reliability test (Cronbach's alpha) indicated good internal consistency reliability of the scale. The confirmatory factor analysis results suggested good fitness of the model.

Compared with Tsai's original scale, nine items were excluded[14]. We are confident about this revision of the SCV-SPMP scale for the following reasons. First, this was a result of exploratory factor analysis, a standard statistical method for item selection. All remaining items did not increase the variance, and the item loading on any of the four factors extracted was lower than 0.5. Second, the exclusion was based

Table 4 Item-subscale correlations of the final 23 items on the SCV-SPMP scale

Items	Subscale 1	Subscale 2	Subscale 3	Subscale 4
Volunteering one's skills and expertise for the welfare of the community	0.74	0.50	0.47	0.48
Being fair	0.81	0.50	0.49	0.35
Being truthful, keeping one's word	0.80	0.51	0.50	0.31
Meeting commitments, dedication	0.80	0.47	0.48	0.48
Recognition of the possibility of conflict of interest and avoidance of relationships that allow personal gain to supersede the best interest of the patient	0.78	0.50	0.48	0.39
Caring, compassion, empathy	0.81	0.54	0.51	0.38
The refusal to violate one's personal and professional codes	0.74	0.55	0.56	0.29
Dress properly	0.41	0.76	0.43	0.36
Address, decorum, and etiquette	0.54	0.79	0.52	0.42
Their work discipline	0.51	0.74	0.53	0.27
Respect patients and their families, commitment to patient confidentiality	0.59	0.74	0.56	0.29
Respect other physicians and professional colleagues such as nurses, medical students, residents, and subspecialty fellows	0.58	0.77	0.55	0.31
Being culture sensitive	0.37	0.70	0.40	0.34
Being accountable to their patients for fulfilling the implied contract governing the patient/physician relationship	0.46	0.46	0.64	0.23
Being accountable to their profession for adhering to medicine's time-honored ethical precepts	0.46	0.47	0.68	0.21
A conscientious effort to exceed ordinary expectations	0.32	0.33	0.65	0.35
A conscientious effort to make a commitment to life-long learning	0.47	0.44	0.73	0.33
Being capable to provide best health care	0.48	0.45	0.74	0.38
Masterly communications and expression, being able to listen	0.49	0.56	0.73	0.30
Awareness of own limitations	0.42	0.47	0.67	0.26
Being available and responsive when "on call"	0.51	0.42	0.42	0.81
Accepting inconvenience to meet the needs of one's patients	0.43	0.39	0.39	0.88
Enduring unavoidable risks to oneself when a patient's welfare is at stake	0.35	0.33	0.31	0.87

Table 5 Fitness of scale

χ^2/df	GFI	AGFI	NNFI	CFI	RMSEA (95% CI)	SRMR
7.62	0.92	0.90	0.92	0.93	0.060 (0.057 to 0.062)	0.05

χ^2: Minimum Fit Function; df: degree of freedom; GFI: Goodness of Fit Index; AGFI: Adjusted Goodness of Fit Index; NNFI: Non-Normed Fit Index; CFI: Comparative Fit Index; RMSEA: Root Mean Square Error of Approximation; SRMR: Standardized Root Mean Square Residual

Table 6 Convergent validity and discriminant validity

Subscales	AVE	Subscale 1	Subscale 2	Subscale 3	Subscale 4
Subscale 1	0.58	**0.76**			
Subscale 2	0.53	0.76	**0.73**		
Subscale 3	0.41	0.73	0.77	**0.64**	
Subscale 4	0.60	0.71	0.64	0.62	**0.77**

AVE: average variance extracted. The bold numbers represent the square roots of each factor's AVE values.

Table 7 Comparison among three medical colleges and between two programs [Mean (SE)]

Category	Subscale 1	Subscale 2	Subscale 3	Subscale 4	Overall
Medical college					
Medical college 1	4.19 (0.02)*	4.12 (0.02)	4.19 (0.02)*	3.25 (0.03)#	4.05 (0.02)*#
Medical college 2	4.32 (0.03)	4.14 (0.03)	4.31 (0.03)	3.31 (0.05)&	4.14 (0.03)
Medical college 3	4.29 (0.04)	4.14 (0.04)	4.24 (0.03)	3.56 (0.05)	4.14 (0.03)
Type of program					
Five-year	4.24 (0.02)	4.12 (0.02)	4.23 (0.02)	3.36 (0.03)**	4.09 (0.02)
Eight-year	4.20 (0.04)	4.15 (0.03)	4.20 (0.03)	3.19 (0.05)	4.06 (0.03)

SE: standard error. *indicates statistically significant differences between medical college 1 and medical college 2; #indicates statistically significant differences between medical college 1 and medical college 3; &indicates statistically significant differences between medical college 2 and medical college 3; **indicates statistically significant differences between the five-year and eight-year programs

on adequate sampling[41]. A total of 1856 students from three types of medical colleges in different grades participated in this study. A balanced gender ratio in the sampling population was observed. Our adequate sampling and participants' diversity in social-demographic characteristics support the robustness of statistical results. Third, after translation, the words and expressions of the excluded items were understandable, but the underlying meaning did not fit current healthcare systems and policies in mainland China[42, 43].

For instance, the item on "Advocating the best possible care regardless of ability to pay" is not realistic or accepted by physicians in mainland China. Since the health insurance system in China cannot cover substantial treatment expenses[42], the leading financial problem for hospitals, physicians, as the hospital's employees, are warned to be concerned about "ability to pay" because physicians' incomes are generally related to the money they earn for their hospitals. The item on "Pursuing the best interest of patients, not self-interest" showed the position physicians should take when confronting a conflict of interest between physicians and patients. The intense relationship between doctors and patients and the general distrust of medical professionals in China have raised numerous discussions[30]. What's more, compared with other developed countries, the value of physicians to society is not fully reflected in their incomes in China, especially in the early years after graduation[44]. Hence, they may not be able to put their self-interest aside. The item on "Commitment to improving access to care" is more related to local healthcare systems than to physicians, since most physicians in mainland China are employees of hospitals, and patients have their own choices of medical institutions according to their insurance type and location[45]. As for the item on "being straightforward", it is not a common approach for Chinese physicians, who tend to communicate in a vaguer and more roundabout way regarding sensitive issues such as a patient's medical condition. In many cases, when someone is diagnosed with a serious illness like cancer, the physician will usually choose to tell the patient's family first instead of the patient[46]. The item "Prudence" was not defined or explained and therefore was thought to have a wide range of meaning, which may influence students' understanding of this word[14].

Item-descriptive results indicated that 23 items in the SCV-SPMP scale were negatively skewed. This showed the same trend as the study in Taiwan[14], which suggested the common cultural heritage, such as Confucianism, of mainland China and Taiwan[47–49].

What's more, high scores for the overall perceptions of professionalism indicated that students in these medical colleges were quite approving of the concept of professionalism. In addition, significant differences in mean scores could be observed among these three medical colleges, possibly because they adopted different training schemes and designed the curricula on their own, although there were government-specified standards for the 5-year program. Further, the education on professionalism was quite dependent on teachers, since the didactic lecture is a common type of teaching method[50].

Further, several questions asked in the second part of the questionnaire were used to collect information on the social-demographic characteristics of participants. More questions could be added to this part if necessary. For example, a question such as whether the students voluntarily chose to major in medicine after the college entrance examination might suggest their willingness to practice medicine at the beginning of medical education. Additionally, some potential factors that may influence students' perceptions, such as the media's negative attitudes towards physicians, can also be explored to indicate possible adjustments to medical education.

The SCV-SPMP scale can have multiple uses. On the one hand, it can be used in a longitudinal research to detect changes in students' perceptions about medical professionalism; on the other hand, it can be used in diverse groups of students to compare the variations in their perceptions.

Several limitations of this study are acknowledged. First, the measurement tool is now set to measure students' perceptions. Whether it can also be used among qualified doctors or other professional groups needs further confirmation. Second, group sampling in three medical colleges may jeopardize the external validity and generalization of the findings. China is a large country providing medical education in different forms of higher education institutions, and program duration varies from three to eight years[50]. Further research is needed to confirm these findings in other institutions and programs. Third, this assessment tool focuses only on medical students' perceptions. To provide an in-depth assessment of healthcare providers, other tools involving behaviors should be introduced in combination[51, 52]. Besides, the test-retest reliability of this scale has not been tested. Finally, the data were collected in 2013, a little far from now.

In conclusion, the SCV-SPMP questionnaire has been proven to be a valid and reliable measurement tool to capture the main features of Chinese medical students' perceptions of medical professionalism in four dimensions. Given its simplicity and easy administration process, it is possible to be used on a large scale. Further, it can also be used in assessing changes in students' perceptions through the grades and comparing differences in perceptions among various student groups.

Acknowledgements

We appreciate Professor TSUEN-CHIUAN TSAI for her kind permission for the use of the original traditional Chinese version scale. We gratefully acknowledge contributions from Kuan LU and Zhuang WAN, as well as from all participants.

Conflict of Interest Statement

The authors declare no conflicts of interest.

REFERENCES

1 Kirch DG, Gusic ME, Ast C. Undergraduate medical education and the foundation of physician professionalism. JAMA, 2015,313(18):1797-1798
2 Marcovitch H. Governance and professionalism in medicine: a UK perspective. JAMA, 2015,313(18):1823-1824
3 Papadakis MA, Teherani A, Banach MA, *et al*. Disciplinary action by medical boards and prior behavior in medical school. N Engl J Med, 2005,353(25):2673-2682
4 Santen SA, Petrusa E, Gruppen LD. The relationship between promotions committees' identification of problem medical students and subsequent state medical board actions. Adv Health Sci Educ Theory Pract, 2015,20(2):421-430
5 Teherani A, Hodgson CS, Banach M, *et al*. Domains of unprofessional behavior during medical school associated with future disciplinary action by a state medical board. Academic Medicine, 2015,80(10 Suppl): 17-20
6 Hou J, Michaud C, Li Z, *et al*. Transformation of the education of health professionals in China: progress and challenges. Lancet, 2014,384(9945):819-827
7 Blackall GF, Melnick SA, Shoop GH, *et al*. Professionalism in medical education: the development and validation of a survey instrument to assess attitudes toward professionalism. Medical Teacher, 2007,29(2-3):e58-e62
8 van Mook WNKA, van Luijk SJ, O'Sullivan H, *et al*. The concepts of professionalism and professional behaviour: Conflicts in both definition and learning outcomes. Eur J Intern Med, 2009,20(4):e85-e89
9 Cruess RL, Cruess SR, Johnston SE. Professionalism: an ideal to be sustained. Lancet, 2000,356(9224):156-159
10 Cruess SR, Cruess RL. Expectations and Obligations: Professionalism and Medicine's social contract with society. Perspect Biol Med, 2008,51(4):579-598
11 Hodges BD, Ginsburg S, Cruess R, *et al*. Assessment of professionalism: Recommendations from the Ottawa 2010 Conference. Med Teach, 2011,33(5):354-363
12 Arnold L. Assessing professional behavior: yesterday, today and tomorrow. Acad Med, 2002,77(6):502-515
13 Project of the ABIM Foundation, ACP-ASIM Foundation, and European Federation of Internal Medicine. Medical professionalism in the new millennium: A Physician Charter. Ann Internal Med, 2002,136(3):243-246
14 Tsai TC, Lin CH, Harasym PH, *et al*. Students' perception on medical professionalism: the psychometric perspective. Med Teach, 2007,29(2-3):128-134
15 Al-Eraky MM, Chandratilake M, Wajid G, *et al*. Medical professionalism: development and validation of the Arabian LAMPS. Med Teach, 2003,35(s1):S56-S62
16 Kim S, Choi S. The medical professionalism of Korean physicians: present and future. BMC Med Ethics, 2015,16(1):56
17 Lombarts KMJMH, Plochg T, Thompson CA, *et al*. Measuring professionalism in medicine and nursing: results of a European survey. PloS One, 2014,9(5):e97069
18 Wang J, He B, Miao X, *et al*. The reliability and validity of a new professionalism assessment scale for young health care workers. Medicine, 2017,96(25):e7058
19 O'Sullivan AJ, Toohey SM. Assessment of professionalism in undergraduate medical students. Med Teach, 2008,30(3):280-286
20 Chen J, Xu J, Zhang C, *et al*. Medical professionalism among clinical physicians in two tertiary hospitals, China. Soc Sci Med, 2013,96:290-296
21 Bowen LM, Williams B, Stanke L. Professionalism among paramedic students: achieving the measure or missing the mark? Adv Med Educ Pract, 2017,8:711-719
22 Kwon HJ, Lee YM, Lee YH, *et al*. Development an instrument assessing residents' attitude towards professionalism lapses in training. Korean J Med Educ, 2017,29(2):81-91
23 Lynch DC, Surdyk PM, Arnold R. Assessing professionalism: a review of the literature. Med Teach, 2004,26(4):366-373
24 Ojuka DK, Olenja JM, Mwango'mbe NJ. Perception of medical professionalism among the surgical community in the University of Nairobi: a mixed method study. BMC Med Educ, 2016,16(1):101
25 Tsugawa Y, Tokuda Y, Ohbu S, *et al*. Professionalism Mini-Evaluation Exercise for medical residents in Japan: a pilot study. Med Educ, 2009,43(10):968-978
26 Baldwin DC, Daugherty SR. Using surveys to assess professionalism in individuals and institutions. In: David Thomas Stern, ed. Measuring medical professionalism. New York: Oxford University Press, 2004:95
27 van Mook WNKA, van Luijk SJ, O'Sullivan H, *et al*. General considerations regarding assessment of professional behaviour. Eur J Intern Med, 2009,20(4): e90-e95
28 Hofstede G. Culture's Consequences: International differences in work-related values. Beverly Hills: SAGE Publications, 1980
29 Schwartz SH. A theory of cultural values and some implications for work. App Psychol, 1999,48(1):23-47
30 Ho MJ, Yu KH, Pan H, *et al*. A Tale of Two Cities: Understanding the differences in medical professionalism between two Chinese cultural contexts. Acad Med, 2014,89(6):944-950
31 Tang J. Defending the dignity in the hustle and bustle: Review on The Eighth China-US Conference on Medical Professionalism. In The Eighth China-US Conference on Medical Professionalism. Beijing: Peking University Health Science Center. 2013
32 Leung DC, Hsu EK, Hui EC. Perceptions of professional attributes in medicine: a qualitative study in Hong Kong. Hong Kong Med J, 2012,18(14):318-324
33 Pan H, Norris JL, Liang YS, *et al*. Building a

professionalism framework for healthcare providers in China: A nominal group technique study. Med Teach, 2013,35(10):e1531-e1536
34 National college student information center. Admission Scores of College Entrance Exam in previous years. Available at: http://gaokao.chsi.com.cn/lqfs/. Accessed December 2, 2018
35 Bonett DG. Sample size requirements for testing and estimating coefficient alpha. J Educ Behav Stat, 2002,27(4):335-340
36 DeVellis RF. Guidelines in scale development. In Scale Development: Theory and Applications: Sage Publications, 1991
37 Helms JE, Henze KT, Sass TL. Treating Cronbach's alpha reliability coefficients as data in counseling research. Counsel Psychol, 2006,34(5):630-660
38 Nunnally JC. Introduction to psychological measurement. New York: McGraw-Hill, 1970
39 Liu Z, Yuan L, Huang Y, *et al*. Development of the Chinese version of the Hospital Autonomy Questionnaire: a cross-sectional study in Guangdong province. BMJ Open, 2016,6(2):e10504
40 Chen TF, Chou KR, Liao YM, *et al*. Construct validity and reliability of the Chinese version of the Disaster Preparedness Evaluation Tool in Taiwan. J Clin Nurs, 2015,24(7-8):1132-1143
41 Schuwirth LW, van der Vleuten CP. Challenges for educationalists. BMJ, 2006,333(7567):544-546
42 Barber SL, Yao L. Development and status of health insurance systems in China. Intern J Health Plan Manage, 2011,26(4):339-356
43 Ginsburg S, Regehr G, Hatala R, *et al*. Context, conflict, and resolution: a new conceptual framework for evaluating professionalism. Acad Med, 2000,75(10):S6-S11
44 Jing S, Jing M, Hu G, *et al*. Welfare, wellness, and job satisfaction of Chinese physicians: a national survey of public tertiary hospitals in China. Intern J Health Plan Manage, 2017,32(3):270-284
45 Yip W, Hsiao W. Harnessing the privatisation of China's fragmented health-care delivery. Lancet, 2014, 384(9945):805-818
46 Raposo VL. Lost in 'Culturation': medical informed consent in China (from a Western perspective). Med Health Care Philos, 2019,22(1):17-30
47 Huo JY. The Analects of Confucius. China Today, 2006,89(12):64-67
48 McSweeney B. Hofstede's model of national cultural differences and their consequences: A triumph of faith -a failure of analysis. Human Relations, 2002,55(1):89-118
49 Yao X. An Introduction to Confucianism. Cambridge: Cambridge University Press, 2000
50 Zhang Q, Lee L, Gruppen L, *et al*. Medical education: changes and perspectives. Med Teach, 2013,35(8):621-627
51 Goldie J. Assessment of professionalism: A consolidation of current thinking. Med Teach, 2013,35(2):e952-e956
52 Guraya SY, Guraya SS, Mahabbat NA, *et al*. The desired concept maps and goal setting for assessing professionalism in medicine. J Clin Diagn Res, 2016, 10(5):JE01

(Received Sep. 9, 2018; revised Mar. 8, 2019)