













# Valid and Convenient Questionnaire Assessment of Chinese Body Constitution: Item Characteristics, Reliability, and Construct Validation

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**Background:** Body constitution is a fundamental concept in traditional Chinese medicine (TCM) for clinical diagnosis, treatment of illness, and community-based health promotion. Clinical assessment of patients' body constitutions, however, has never been easy and consistent, even by well-trained clinicians and TCM practitioners. Therefore, questionnaires such as the popular Constitution in Chinese Medicine Questionnaire (CCMQ) can be an appealing and convenient assessment alternative. The present research borrowed advanced methodologies for questionnaire development in psychology and other social sciences to examine the performance of the CCMQ in terms of (i) the strength of relations of each item with its designated constitution, (ii) the reliabilities of each constitution, and (iii) the overall 9-constitution structure. This research provided empirical evidence to support the use of the CCMQ and proposed directions for refinement in future revisions of the CCMQ or similar measures.

**Methods:** A total of 1571 volunteers from three villages in southern China participated in the CCMQ survey. The item characteristics, reliabilities, interconstitution correlations, and confirmatory factor analysis of the 9-body-constitution structure were examined.

**Results:** The results generally supported the appropriateness of the clinical observations (the questionnaire items) and the CCMQ 9-constitution classification structure. Nevertheless, some relatively weaker items, item pairs with similar meanings, and highly overlapping constitutions were identified for future CCMQ revisions.

**Conclusion:** The CCMQ measured the 9 constitutions efficiently and with reasonably good reliability and construct validity. Given the various challenges to assessing TCM body constitutions even by experienced clinicians, the CCMQ provides an appealing alternative to measure the Chinese body constitutions of healthy participants in large-scale research or community health promotion programs. The present study also demonstrated how advanced methodologies in social sciences can help validate and refine the CCMQ and similar complementary medicine measures.

**Keywords:** Chinese constitution, body constitution, CCMQ, Constitution in Chinese Medicine Questionnaire, reliability, construct validity

## Introduction

Body constitution, an ancient concept of traditional Chinese medicine (TCM), postulates that people have relatively stable unique morphological structures and physiological, psychological, and functional activities due to genetic

disposition, acquired factors, and self-regulation.<sup>1</sup> People can be classified, therefore, by these similarities and differences in body constitution into many different “types”.<sup>2–4</sup> The determination of body constitution helps the effective treatment of illness, health maintenance, and disease prevention. Given that our body constitutions are partly determined from birth through heredity, the knowledge of our constitutions greatly facilitates health maintenance and disease prevention.

Accurately identifying body constitution has never been easy, even for experienced clinicians. Interrater consistency was a major concern,<sup>5,6</sup> and people tried to standardize and develop structured TCM interviews.<sup>7</sup> Even for 5-year or more experienced acupuncturists, for example, 4 to 6 of them were needed to obtain reliable *yin* and *yang* deficiency ratings.<sup>8</sup> Training helped improve interrater reliability from 0.11 to 0.62 after three rounds of discussion and training.<sup>9</sup> Reviews by Brien and Birch<sup>10</sup> also showed that the reliabilities of pulse diagnosis were low to very good, while those of tongue and other diagnoses varied.

Obviously, more training and having several clinicians diagnose each patient or research participant is time-consuming, resource-demanding, and impractical for large-scale empirical research or community health promotion programs. A high-quality questionnaire, therefore, becomes an appealing alternative. Despite such a demand, constructing a valid and reliable instrument is also challenging, particularly in developing an assessment for the healthy general population. It is difficult for clinicians to accurately assess patients with observable illness symptoms, so developing a questionnaire applicable to the nonsymptomatic healthy general population will be even more difficult. Such attempts included the questionnaires on cold, heat, complex, and phlegm.<sup>11,12</sup> Among them,<sup>13–17</sup> the Constitution in Chinese Medicine Questionnaire (CCMQ)<sup>18–20</sup> was probably the most comprehensive and widely used.

The CCMQ by Wang et al was developed in China<sup>18–20</sup> but also has been translated and used in Canada, Japan, Korea, and the USA, among other countries.<sup>21–23</sup> It consists of 60 items with 9 subscales, each measuring one Chinese body constitution. The items (clinical observations; eg, “Did you get tired easily?”) measure participants’ feelings or symptoms in the last year. It has been shown to have reasonably good psychometric properties<sup>24,25</sup> in various medical settings.<sup>26–30</sup> Versions of 60, 41, and 30 items in Chinese, English, and Japanese<sup>23,31</sup> have been developed and evaluated,<sup>32</sup> with over 2277 papers, 55% of which are journal articles published between 2006 and 2016.<sup>33</sup>

Despite its popularity, challenges to its use included<sup>34</sup> (i) difficulty for people with limited education to understand some items, (ii) questionable classification of some items, (iii) many items classified as mixed body constitution, (iv) some items cross-linked to multiple body constitutions,<sup>34–36</sup> (v) the originally proposed structure could not be reproduced with empirical data (eg, 8 factors found in research despite the 9 originally proposed in CCMQ),<sup>32,37</sup> and (vi) items not allocated to their intended constitutions (many items in some constitutions, but few items in others).<sup>32,37</sup> The interrelations among the original items (indicators) were not carefully examined in the previous factor analyses. The more appropriate confirmatory factor analysis was used with patients only in Hong Kong SAR to confirm its original constitution structure.<sup>38</sup> However, the results were dubious, with 5 items with standardized loadings larger than 1, 7 items in the unexpected direction (negative instead), and 1 item with extremely low loading (−0.01), suggesting likely inappropriate modeling and the misclassification of items.

The present study contributed academically by adopting advanced methodologies commonly used in psychology and other social sciences questionnaire development.<sup>39</sup> Importantly, the traditional exploratory factor analysis used in earlier studies<sup>32,37</sup> was replaced by the more appropriate confirmatory factor analysis in this study. The more commonly used exploratory factor analysis can help researchers group items with an unknown structure into factors.<sup>39,40</sup> In contrast, confirmatory factor analysis works with items with a known grouping (factors) and provides statistics (fit indices) to inform researchers whether such a grouping is supported or not. Thus, as the grouping (structure) of the CCMQ items was provided by Wang et al,<sup>18–20</sup> confirmatory factor analysis was the proper method to examine the correctness of the original item classifications.

Specifically, this study provides empirical evidence on the construct validation and reliability information of the CCMQ. The objectives were to examine (i) the appropriateness of each item (clinical observations of the constitutions) as a measure of its original intended constitutions, (ii) the internal consistency reliability of each constitution, and (iii) the convergent (coherent)/divergent (discriminating) relations among the constitutions. The study not only evaluated the overall fit of the original 9-constitution structure but also examined the suitability of each individual item in the

instrument. The information is essential to support the use of this important CCMQ in large-scale research or community health promotion programs when a high-quality and convenient Chinese body constitution instrument is needed.

## Materials and Methods

### Participants

The 1571 voluntary participants, who individually provided their consent, were residents from three villages in Foshan, a city in Guangdong Province in the southern part of China with a population of approximately 5000. The survey was conducted at local clinics, but only their first-visit responses were used in the analyses, even if they made further visits for other purposes. There were more females than males, and there were more older (older than 40) than younger participants (Table 1).

### Ethical Considerations

This study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained for this project from the Research Ethics Committee of Guangdong Provincial Hospital of Chinese Medicine (Reference No: B2013-009-01/B2017-150-01). The participants provided written informed consent before answering the survey questionnaire.

### Measures

The CCMQ consisted of 60 items (clinical observations, indicators of constitutions, Table 2) categorized into 9 subscales, each measuring one of the 9 different body constitutions, namely, Yang-deficient (7 items), Yin-deficient (8 items), Qi-deficient (8 items), Phlegm-dampness (8 items), Damp-heat (6 items), Stagnant Blood (7 items), Inherited Special (7 items), Stagnant Qi (7 items), and Balanced (8 items). The items were on a 5-point Likert scale, with high scores indicating a higher likelihood of having the given constitution. Usually, a threshold of 30 or higher points on a subscale was used to classify a person as having that body constitution.

**Table 1** Demographic Characteristics of Participants (n = 1571)

Demographic Characteristic	n	%
Gender		
Male	510	32.5
Female	1061	67.5
Age group		
0–20 years old	25	1.6
21–40 years old	346	22.0
41–60 years old	571	36.3
>61 years old	628	40.0
Not disclosing/missing	1	0.1
Education		
Less education /Primary school	669	42.6
Junior secondary education	375	23.9
Senior secondary education	196	12.4
Tertiary education	189	12.0
Not disclosing/missing	142	9.0
Marital status		
Single	91	5.8
Married	1232	78.4
Widower, separated/divorced	84	5.3
Not disclosing/missing	164	10.4

**Table 2** Reliabilities of 9 Subscales, Item Content, and Standardized Loadings

Item Number	Item Content*	Factor Loading
Scale 1 (Yang-deficient constitution; $\alpha = 0.740$ )		
Q18	Did your hands or feet feel cold or clammy?	0.710
Q19	Did you feel clod easily in your abdomen, back, lower back or knees?	0.794
Q20	Were you sensitive to cold and tend to wear more clothes than others?	0.684
Q52	Did you feel uncomfortable when you drank or ate something cold, or do you avoid drinking or eating something cold?	0.488
Q55	Did you easily contract diarrhea when you were exposed to cold or eat (or drink) something cold?	0.455
Scale 2 (Yin-deficient constitution; $\alpha = 0.742$ )		
Q17	Did the palms of your hands or soles of your feet feel hot?	0.341
Q21	Did your body and face feel hot?	0.488
Q35	Did your skin or lips feel dry?	0.659
Q38	Did you get hot flashes?	0.369
Q44	Did your eyes feel dry and use eye drops?	0.611
Q46	Did you often feel parched and need to drink water?	0.600
Q57	Did you get constipated easily or have dry stools?	0.473
Scale 3 (Qi-deficient constitution; $\alpha = 0.725$ )		
Q3	Did you suffer from shortness of breath?	0.604
Q4	Did you get palpitations?	0.582
Q5	Did you get dizziness easily or become giddy when standing up?	0.592
Q6	Did you prefer quietness and do not like to talk?	0.597
Q23	Did you catch colds more easily than others?	0.468
Q27	Did you sweat easily when you had a slightly increased physical activity?	0.476
Scale 4 (Phlegm-dampness constitution; $\alpha = 0.706$ )		
Q14	Did you feel chest or stomach stuffiness?	0.461
Q28	Did you have an excessively oily forehead and/or T-zone?	0.616
Q42	Did you have upper eyelid swelling?	0.433
Q49	Did your mouth feel sticky?	0.403
Q50	Was your stomach/belly flabby?	0.483
Q51	Did you have lots of phlegm?	0.430
Q58	Did your tongue have a thick coating?	0.579
Scale 5 (Damp-heat constitution; $\alpha = 0.767$ )		
Q39	Did your nose or your face feel greasy, oily, or shiny?	0.703
Q41	Did you get acne or sores easily?	0.564
Q48	Did you have bitterness or a strange taste in your mouth?	0.470
Q56	Did you pass sticky stools and/or feel that your bowel movement is incomplete?	0.606
Q59	Did your urethral canal feel hot when you urinated, or did your urine have a dark color?	0.584
Q60	Was your vaginal discharge yellowish/Was your scrotum always wet?	0.463
Scale 6 (Stagnant Blood constitution; $\alpha = 0.638$ )		
Q37	Did you feel pain somewhere in your body?	0.482
Q40	Did you have a dark face?	0.482
Q43	Did you get dark circles under the eyes easily?	0.566
Q45	Did your lips darker, more blue or purple than usual?	0.558
Scale 7 (Inherited Special constitution; $\alpha = 0.731$ )		
Q24	Did you sneeze even when you did not have a cold?	0.692
Q25	Did you have runny or stuffy nose even when you did not have a cold?	0.631
Q26	Did you cough due to seasonal change, temperature change, or unpleasant odor?	0.447

(Continued)

**Table 2** (Continued).

Item Number	Item Content*	Factor Loading
Q30	Did you have allergies? eg, medicine, food, odors, pollen etc.	0.363
Q31	Did your skin get hives/urticaria easily?	0.307
Q34	Did you skin turn red and show traces when you scratched it?	0.493
Q47	Did your throat feel strange (ie, Like something was stuck or there was a lump in your throat)?	0.420
Scale 8 (Stagnant Qi constitution; $\alpha = 0.831$ )		
Q10	Do you get anxious and worried easily?	0.590
Q11	Did you feel sensitive, vulnerable or emotionally upset?	0.665
Q12	Were you easily scared or frightened?	0.634
Q13	Did you experience distention in the underarm or breast?	0.359
Q15	Did you sigh for no reason?	0.571
Q16	Did your body feel heavy or lethargic?	0.608
Scale 9 (Balanced constitution; all items coded in a reversed direction, $\alpha = 0.721$ )		
Q2	Did you get tired easily?	0.645
Q8	Did you forget things easily?	0.667
Q9	Did you feel gloomy and depressed?	0.660
Q22	Did you feel more vulnerable to the cold than others?	0.617
Q54	Did you suffer from insomnia?	0.518

**Notes:** \*These English items were based on the translation by Jing, Wang, Wang. Data from Jing HR, Wang J, Wang Q. Preliminary compiling of English version of Constitution in Chinese Medicine Questionnaire. *J Anhui Univ Chinese Med.* 2015;34(5):21–25.<sup>31</sup>

## Analyses

As there were more females and older participants, a weight (inverse to the group ratio) was added so that all analyses were based on a weighted sample with equal representation of the gender and age groups. In this study, the original structure and classifications of the CCMQ items were known. Thus, confirmatory factor analysis was more appropriately used to assess the suitability of this 9-constitution classification.

To assess whether the items (clinical observations) consistently assessed the respective constitutions, internal consistency reliability measured by Cronbach's alpha was computed for each of the 9 constitutions (Table 2). In the confirmatory factor analysis, (i) the strength of the relationship of each item to the constitution (ie, factor loading) showing possible misclassified items, (ii) the overall success in measuring the 9 constitutions (ie, model fit), and (iii) the possible weak items measuring more than one constitution (ie, correlated uniqueness in confirmatory factor analysis terminology) were examined with the commercial software Mplus 8.1.<sup>40</sup>

## Results

### Preliminary Analyses—Identification of Misclassified Items

In the first stage of the analyses, weak items unrelated to their originally intended and other constitutions were identified and removed. This was based on (i) Cronbach's alpha (Table 2), (ii) Cronbach's alpha if-item-deleted, and (iii) corrected item-total correlations. Unless there were strong face-validity reasons, items were potentially removed if (i) they had low corrected item-total correlations, (ii) Cronbach's alpha was substantially improved when they were deleted, (iii) they had low correlations with other items in the same scale, and (iv) they had low correlations with other constitutions (ie, impossible to reassign to another constitution). Seven items were removed using these criteria (Q1, Q7, Q29, Q32, Q33, Q36, and Q53).

## Strength of Relations with Respective constitutions—reliability and Factor Loadings

This study showed that items within each constitution were consistently correlated, with the reliabilities of the constitutions ranging from 0.638 to 0.831 (see Table 2); the lowest reliability, 0.638, was associated with the shortest scale with only 4 items. Confirmatory factor analysis of the 9 factors (Table 2) was conducted on the remaining 53 items, with items grouped under their respective constitutions, and all constitutions were allowed to be correlated. Items were reasonably related to their respective constitutions, with standardized factor loadings ranging from 0.307 to 0.793. Only 5 items had loadings less than 0.4, suggesting that they were weaker items less related to their constitutions and required closer examination in future CCMQ revisions. They were Q17 (Did the palms of your hands or soles of your feet feel hot?), Q38 (Did you get hot flashes?), Q30 [Did you have allergies (eg, medicine, food, odors, pollen, etc.)], Q31 (Did your skin get hives/urticaria easily?), and Q13 (Did you experience distention in the underarm or breast?).

## Overall Appropriateness of the 9-Constitutions Structure—Model Fit

The assessment of the overall 9 constitution structures with confirmatory factor analysis showed that Phlegm-dampness (Factor 4, F4) was extremely highly correlated with the Damp-heat constitution (F5), resulting in an improper (mathematically nonpositive definite) solution. This suggested that Phlegm-dampness and Damp-heat cannot be effectively differentiated from the present set of items. Consequently, they were grouped as a new Dampness factor (a second-order factor F10). Furthermore, some of these clinical observations (the 53 items) in the same or different constitutions were very similar and strongly related (see next section; correlated uniquenesses in the confirmatory factor analysis terminology). The overall fit of the 53 items to the eventual model was acceptable; various indices of model fit were  $\chi^2$  (1263) = 4516.27, RMSEA = 0.040 (90% CI, 0.039–0.042), Prob. (RMSEA  $\leq$  0.05) = 1.000, CFI = 0.90, TLI = 0.89. Using the criteria generally adopted,<sup>41,42</sup> the fit indices reaffirmed that the data collected fit the originally intended 9-constitution structure reasonably well.

## Items (Clinical Observations) Related to More Than One Constitution (Correlated Items)

As discussed above, it was reasonable to postulate before assessing the model fit that some clinical observations (the items) in the same or different constitutions captured similar clinical characteristics and were thus highly correlated. For example, Q24 (Did you sneeze even when you did not have a cold?) and Q25 (Did you have a runny or stuffy nose even when you did not have a cold?), both in the Inherited Special constitution (F7), were strongly related (standardized correlated uniqueness = 0.39). This showed that Q24 and Q25 had commonality over and above (statistically a correlated uniqueness) that captured by their common Inherited Special constitution (F7). Similarly, Q31 and Q30 (both in F7; correlated uniqueness = 0.20) and Q39 and Q41 (both in F5, correlated uniqueness = 0.20) had similarly substantial correlations. As these item pairs came from the same constitutions, one of the two items can be removed, or the two items can be combined in future CCMQ revisions.

There were also pairs of clinical observations coming from two different constitutions. They included, for example, Q20 (F1) and Q22 (F9; correlated uniqueness = 0.37); Q39 (F5) and Q28 (F4; 0.33); Q57 (F2) and Q56 (F5; 0.21); Q22 (F9) and Q19 (F1; 0.23); Q48 (F5) and Q46 (F2; 0.20); and Q51 (F4) and Q47 (F7; 0.20), which came from two constitutions and were correlated. For these item pairs from different constitutions, (i) one or both items in the item pair can be revised so that they focus on one constitution only, or (ii) one or both items in the item pair can be removed if they have double and confusing meanings.

## Relations Among Constitutions

The correlations among the constitutions (Table 3) showed moderate to strong relations, supporting their commonality in measuring the individuals' TCM body characteristics. It was also noted that the Balanced constitution (F9) was negatively correlated with all other scales, which suggested it was measuring body constitution from an opposite perspective to those of the other eight constitutions. In general, it was understandable that the Phlegm-dampness constitution (F4) and Damp-heat constitution (F5), both measuring “dampness”, were highly correlated. Similarly, the

**Table 3** Correlations Among the Constitutions Scores\*

	F1	F2	F3	F4	F5	F6	F7	F8	F9
F1 (Yang-deficient)	1								
F2 (Yin-deficient)	0.607	1							
F3 (Qi-deficient)	0.611	0.650	1						
F4 (Phlegm-dampness)	0.500	0.682	0.579	1					
F5 (Damp-heat)	0.507	0.711	0.542	0.725	1				
F6 (Stagnant Blood)	0.482	0.597	0.489	0.528	0.560	1			
F7 (Inherited Special)	0.498	0.576	0.582	0.572	0.520	0.460	1		
F8 (Stagnant qi)	0.579	0.641	0.681	0.560	0.533	0.514	0.491	1	
F9 (Balanced)	-0.663	-0.648	-0.738	-0.563	-0.533	-0.555	-0.529	-0.713	1

**Note:** \*Based on a weighted sample balanced on gender and age.

Yang-deficient constitution (F1), Yin-deficient constitution (F2), and Qi-deficient constitution (F3) were also moderately to highly correlated, measuring “deficiency”. The Stagnant Qi constitution (F8) and Balanced constitution (F9) were closely but negatively related. The Stagnant Blood constitution (F6) and Inherited Special constitution (F7) were two constitutions much less associated with the remaining constitutions (F1, F2, F3, F4, F5, F8, F9).

## Discussion

The quality and usefulness of the CCMQ were assessed comprehensively from a wide range of psychometric properties. Specifically, (a) the reliability of each constitution was reasonably high (0.638–0.831), (b) most item-constitution relations (ie, factor loading) were high, and five items with weaker loadings were identified, and (c) confirmatory factor analysis showed good fit of data to the model, broadly supporting the appropriateness of the clinical observations (the questionnaire items) as measures of their intended 9 constitutions. That is, the CCMQ instrument successfully captured the general construct of Chinese body constitutions, while the 9 (eventually combined into 8) separate scales also appropriately differentiated the body constitutions.

At this juncture, we would like to point out that our findings on the performance of CCMQ constitutions and items have direct implications on CTM clinical diagnosis, prognosis, and treatment in general. Thus, for example, our results showed that the Phlegm-dampness and Damp-heat scales were highly correlated. This suggested that in clinical assessment and treatment, clinicians would find great difficulties in differentiating these two constitutions. Clinicians and instrument developers must identify new items to better differentiate these two constitutions. Similarly, for the weak items we identified below, clinicians are also alerted that clinical observations on these symptoms may have to be adjusted accordingly (see Table 4).

Based on the reliability analyses, 7 items (Q1, Q7, Q29, Q32, Q33, Q36, and Q53) were removed from this study. In a previous study,<sup>43</sup> these items (except Q29) were also deleted based on their psychometric properties (eg, Cronbach’s alpha, item response theory) and expert panel opinion (face validity). The results and recommendations in this study were, therefore, generally consistent with a previous study.<sup>43</sup> Contentwise, Q29 (Were your lips redder than others?) in the Yin-deficient constitution (F2) seemed essential for identifying the Yin-deficient constitution. While it is true that some people’s lips with Yin-deficient constitution might be redder than others, it is also possible that some people with Damp-heat constitution might also have similar characteristics. Such items may not discriminate well in the identification of the constitution. It could be one of the potential items, therefore, for deletion in future CCMQ revisions.

This study showed that 5 items (Q13, Q17, Q30, Q31, and Q38) were weaker measures of their respective constitutions (loading less than 0.4). In previous studies,<sup>43,44</sup> Q38 and Q31 were also recommended to be removed based on psychometric properties and expert panel opinion (face validity). Relatively, Q17, Q30, and Q13 also had weaker relations with their constitutions. However, they appeared to be important indicators in body constitution identification in clinical diagnosis and can be retained. Nevertheless, these items can still be revisited and polished in

**Table 4** Summary of Findings and Implications to Clinicians and Instrument Construction

Findings and Implications
<p><b>A. Items/symptoms unrelated to their original constitution or other constitutions, recommend not to use</b>            Q1 (energetic), Q7 (weak when talk), Q29 (red lips), Q32 (purpura allergy), Q33 (black/purple bruises), Q36 (visible capillary), Q53 (adapt external environment)</p> <p><b>B. Items/symptoms low relations with original constitutions, recommend to revise</b>            Q17 (Palms/Hands/Feet sole hot, Yin-deficient), Q38 (hot flashes, Yin-deficient), Q30 (allergies, Inherited), Q31 (skin hives/urticaria, Inherited Special), Q13 (distention underarm/breast, Stagnant Qi)</p> <p><b>C. Item-pairs/symptom-pairs, highly correlated within the same constitutions, duplicating indicators with similar meaning, perhaps ask one in the pairs only</b>            Q24 (sneeze without have a cold?) + Q25 (runny/stuffy nose without cold) in Inherited Special            Q31 (skin hives/urticaria) + Q30 (allergy) in Inherited Special            Q39 (greasy nose/face) + Q41 (acne, sores) Damp-heat</p> <p><b>D. Item-pairs/symptom-pairs, highly correlated, they came from two constitutions, double meaning; recommend to revise the items/symptoms so that they focus on one constitution only</b>            Q20 (sensitive to cold, Yang-deficient) + Q22 (vulnerable to cold, Balanced)            Q39 (nose/face greasy, Damp-heat) + Q28 (oily forehead, Phlegm-damp)            Q57 (constipate, Yin-deficient) + Q56 (sticky stools, Damp)            Q22 (vulnerable to cold, Balanced) + Q19 (cold abdomen, back, Yang-deficient)            Q48 (bitter mouth, Damp-heat) + Q46 (parched, need water, Yin-deficient)            Q51 (phlegm, Phlegm-damp) and Q47 (throat strange, Inherited Special)</p> <p><b>E. Highly correlated constitutions, hard to differentiate, may need more new symptoms to differentiate these two constitutions</b>            Phlegm-dampness + Damp-heat constitution</p> <p><b>F. Not all constitutions are positively related, handle with care</b>            Balanced Constitution negatively related to all other constitutions, it measured body constitutions from an opposite perspective to those of other 8 constitutions</p>

future CCMQ revisions. For example, in Q17, “Do the palms of your hands or soles of your feet feel hot?”, some people might have hot palms but cold soles (rather than both hot) and would have difficulty answering this item. Importantly, this study helped identify items that should be carefully examined and further polished.

Although the study started with a 9-constitution structure, the results suggested that some constitutions (eg, Phlegm-dampness constitution, Damp-heat constitution) were highly correlated and hard to differentiate by the participants using the present set of items. Furthermore, the differentiation of other constitutions can also be revisited and improved. For example, high correlations were observed between Q24 and Q25, Q31 and Q30, and Q39 and Q41. These results suggested that the items in these item pairs can be less discriminating, confusing, or similar for many patients. Notably, again, this study identified items or item pairs that can be revised or removed in future CCMQ revisions.

The conclusions drawn from the present study were limited by the participants being recruited from three villages in southern China. Future replications with participants from other geographic regions in China or other countries would provide information on how generalizable the results in this study are for future CCMQ revisions.

## Conclusions

In this study, the items and structure of a popular TCM body constitution questionnaire were carefully assessed with a sufficiently large sample size of healthy participants. Generally, the results showed that the CCMQ had reasonably good reliability, differentiating constitution structure, and construct validity to support its use as a valid and convenient Chinese body constitution assessment instrument. Nonetheless, through the analyses of its reliabilities, correlations of items to their respective constitutions, relations among the constitutions, and correlations among item pairs, various issues with the items or constitutions have been identified to facilitate future CCMQ revisions or enhancements. This agrees with the CCMQ’s original authors’ recommendation that accumulated experience would help our timely revisions of the original instruments.<sup>34</sup> Indirectly, this study also provided an exemplary practical approach based on advanced



methodologies used in psychology and other social sciences to analyze and refine the CCMQ and other TCM questionnaires. Our results have similar critical applications for CTM clinicians using various symptoms as measures of Chinese constitutions in assessment, treatment, and health promotion (see Table 4).

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## Disclosure

The authors declare that they have no competing interests in this work.

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