

Validation of the English Version Constitution in Chinese Medicine Questionnaire (CCMQ) among Young Adults in Malaysia

NG FL^{1,2}, FOO CN^{1,3}, YAP SY¹, LIM YM^{1,4*}

¹Centre for Cancer Research, ²Department of Chinese Medicine, ³Department of Population Medicine, ⁴Department of Pre-clinical Sciences, M. Kandiah Faculty of Medicine and Health Sciences, Universiti Tunku Abdul Rahman, Jalan Sungai Long, Bandar Sungai Long, 43000, Kajang, Cheras, Selangor, Malaysia.

ABSTRAK

Soal selidik konstitusi dalam perubatan Cina (CCMQ) digunakan secara meluas sebagai instrumen kesihatan yang ditadbir sendiri. Ia dijadikan sebagai garis panduan bagi prognosis, pencegahan dan rawatan pelbagai penyakit. Kajian ini bertujuan untuk mengesahkan versi Bahasa Inggeris CCMQ yang terdiri daripada sembilan domain dengan sejumlah 67 soalan di Malaysia. Tinjauan dijalankan dalam tiga fasa. Fasa pertama melibatkan penterjemahan dan penyesuaian instrumen tinjauan versi Cina kepada versi Bahasa Inggeris. Di fasa kedua, Delphi telah digunakan untuk menyemak, meminda dan mengesahkan versi Bahasa Inggeris yang diterjemahkan. Di fasa ketiga, 114 subjek (berumur 18 hingga 30 tahun) telah dimasukkan ke dalam pengesahan faktor analisis untuk menentukan sifat psikometriknya. Analisis kesahan konstruk CCMQ menunjukkan kesesuaian yang baik bagi model yang dihipotesiskan. Nilai kebolehpercayaan komposit (CR) berjalut dari 0.869 hingga 0.908, dan nilai purata varians yang diekstrak (AVE) berjalut dari 0.647 hingga 0.764, masing-masing menunjukkan kebolehpercayaan ketekalan dalaman yang baik dan kesahan konvergen. Nilai nisbah Heterotrait-monotrait nisbah korelasi (HTMT) yang diperolehi bagi semua domain berjalut dari 0.151 hingga 0.652, di mana ia memenuhi kriteria kesahan diskriminasi. Versi Bahasa Inggeris CCMQ adalah instrumen pertama yang disahkan secara statistik di Malaysia. Ia merupakan instrumen yang boleh dipercayai dan sah untuk kajian konstitusi badan perubatan Cina tradisional. Penyelidikan masa depan harus dijalankan untuk mengesah CCMQ sebagai alat peramal dalam kajian hasil berkaitan kesihatan.

Kata kunci: kajian pengesahan, konstitusi badan, Malaysia, perubatan, traditional cina

Address for correspondence and reprint requests: Professor Ts. Dr. Lim Yang Mooi. Department of Pre-clinical Sciences, M. Kandiah Faculty of Medicine and Health Sciences, Universiti Tunku Abdul Rahman, Jalan Sungai Long, Bandar Sungai Long, 43000, Kajang, Cheras, Selangor, Malaysia. Tel: +603-90860288 Email: ymlim@utar.edu.my

ABSTRACT

Constitution in Chinese Medicine Questionnaire (CCMQ) is widely used as a self-administered health instrument. It was used as the guiding tool for prognosis, prevention and treatment of various diseases. This study aims to validate an English version of the Constitution in Chinese Medicine Questionnaire (CCMQ) in Malaysia, which is comprised of nine domains with a total of 67 questions. The survey was conducted in three phases. Phase one involved translation and adaption where the Chinese version of the survey instrument was translated into the English version. In phase two, a Delphi was used to review, amend and validate the translated English version; and in phase three, 114 subjects (aged 18 to 30 years old) were included in the confirmatory factor analysis to determine its psychometric properties. The construct validity analysis of CCMQ showed a good fit for the hypothesised models. Composite reliability (CR) values ranging from 0.869 to 0.908, and average variance extracted (AVE) values ranged from 0.647 to 0.764, indicating good internal consistency reliability and convergent validity, respectively. The heterotrait-monotrait ratio of correlations (HTMT) values obtained for all the domains ranging from 0.151 to 0.652, which fulfilled the criteria of discriminant validity. The English version of the CCMQ was the first statistically validated instrument in Malaysia. It is a reliable and valid instrument for traditional Chinese medicine body constitution (TCMBC) study. Future research is needed to validate the CCMQ as a predicting tool in health-related outcome studies.

Keywords: body constitution, chinese traditional, Malaysia, medicine, validation study

INTRODUCTION

Traditional Chinese Medicine Body Constitution (TCMBC) originates from the Yellow Emperor's Canon of Medicine and the theory of TCMBC was first proposed by traditional Chinese medicine (TCM) scholars in the late 1970s (Wang 2012; Wang et al. 2013; Sun et al. 2018). The TCMBC is a new division from TCM (Li et al. 2020 a). The most recognised version of TCMBC is proposed by Wang Qi, which contains nine types of body constitutions and it provides insight into personalised medicine (Wang

2005; Li et al. 2020b). The nine types of TCM body constitutions can be divided into healthy and unhealthy categories which reflect the balanced constitution and eight types of biased constitutions respectively. The TCM body constitution indicates the dynamic healthy state of an individual and can be influenced by innate and acquired factors (Low et al. 2016; Liang et al. 2020).

The balanced constitution becomes the protective factor against disease and also a preservation factor for health (Yap et al. 2021; Zhang et al. 2021b). The eight biased TCMBC

mostly became the predictor for death and morbidity of diseases such as cancer, depression, dysmenorrhea, hypertension, metabolic syndrome, coronary heart disease, diabetes mellitus, cerebrovascular disease and others (Liu et al. 2016; Zhu et al. 2017; Chong et al. 2018; Liang et al. 2020; Liao et al. 2021; Yap et al. 2021; Zhang et al. 2021b; Yap et al. 2022). Over the past decade, researchers also integrated TCMBC with genomics, proteomics and metabolomics (Wu et al. 2010; Yu et al. 2017a; Yang et al. 2019; Deng et al. 2021; Hou et al. 2021; Zhang et al. 2021a). Researchers found that the single nucleotide polymorphisms (SNPs), the adrenergic receptor beta-3 (ADRB3) gene, lipid metabolic genes (diacylglycerol acyltransferase (DGAT2), acyl-CoA synthetase (ACSL1) and ATP-binding cassette subfamily A member 1 (ABCA1) tended to be high expression among Yang-deficiency constitution and Yin-deficiency constitution; uncoupling protein 1 (UCP1) tended to be high expression among phlegm-stasis constitution in obesity patients (Yu et al. 2017a; Hou et al. 2021). Apart from that, phosphatidylcholine (PC), Complement C3, C4a/C4b, A2M and SERPINF1 are the strong predicting biomarkers for phlegm-dampness constitution in hypertension patients (Yang et al. 2019; Zhang et al. 2021a).

The TCMBC could be referred as individualisation guidance for clinical prevention, diagnosis, treatment and prognosis of the disease (Han et al. 2013; Yu et al. 2017b; Ma et al. 2018; Liu et al. 2019; Liang et al. 2020; Hou et al. 2021; Zhang et al. 2021c). Hence, the

personalised TCM body constitution can be used as an approach to improve public health, prediction, alleviation and prevention of illness (Wang et al. 2013; Li et al. 2019; Chen et al. 2021).

Constitution of Chinese Medicine Questionnaire (CCMQ) is the survey instrument developed by Wang et al. in 2005 and it contains 67 questions to measure nine types of body constitution (Wang et al. 2005). The nine types of body constitution include; (i) Balanced constitution (BC); (ii) Qi-deficiency constitution (QDC); (iii) Yang-deficiency constitution (YADC); (iv) Yin-deficiency constitution (YIDC); (v) Phlegm-dampness constitution (PDC); (vi) Damp-heat constitution (DHC); (vii) Qi-stagnation constitution (QSC); (viii) Blood-stasis constitution (BSC); and (ix) inherited-special constitution (ISC). The validity and reliability of CCMQ (the spearman correlation coefficient of the nine sub scale was 0.76-0.90, internal consistency (Cronbach's coefficient) for each sub scale was 0.72-0.80) was first conducted with 2500 participants from Beijing population (Zhu et al. 2007). Aside from China, Hong Kong China, Korea and Japan also had validated CCMQ in their respective country, this is due to the different culture, ethics, linguistics and geographical factors (Zhu et al. 2008; Wong et al. 2013; Li et al. 2015). The validation of the English version of CCMQ also had been conducted on American and Canadian Caucasian populations who lived in Beijing between 2011-2012 (Jing et al. 2018). The standard of classification of body constitution contributes a positive effect in TCM diagnosis, predictive and treatment model in clinical practice

and public health (Wang et al. 2015).

In 2020, the top five causes of death in Malaysia were ischemic heart disease, pneumonia, cerebrovascular diseases, transport accidents and cancer (Department of Statistics Malaysia 2022). The personalised TCM body constitution can help in implementing the individualised management of those diseases. English is a widely spoken and written language in Malaysia (Vollmann & Wooi 2019). Thus, we chose to validate the CCMQ in English version because it is easy to be self-administer and can be widely applied as a TCM screening tool by the multi-ethnic populations in Malaysia. In addition, this is the first study conducted to provide empirical evidence to validate the TCMBC in Malaysia.

The objective of this study was to adapt and validate the English version of CCMQ in Malaysia to establish the evidence on the nine domains with a total of 67 questions.

MATERIALS AND METHODS

Study Design

The cultural adaptation and validation of the English version of CCMQ were carried out in three phases (Figure 1). Phase one was the translation and adaption phase where translating the Chinese version of the survey instrument into the English version. Phase two, a Delphi was used to review, amend and validate the translated English version. The Delphi method was chosen as it is commonly used to gain consensus among a panel

of experts on a complex issue or lack of knowledge (Jorm 2015). It has also been widely applied in health and mental health research (Jorm 2015). In phase three, a survey was conducted using the instrument derived from phase two. Online questionnaires were then distributed to young adults (aged 18 to 30 years old) in Malaysia via google form. The sample size of this study was calculated using the G* Power programme based on the medium effect size and power of 80%. The minimum required sample size was 114 subjects. Confirmatory factor analysis was used to analyse the instrument from the findings obtained from phase three. This study obtained ethical approval from the Universiti Tunku Abdul Rahman Ethics Committee for research involving human subjects (U/SERC/50/2020).

Phase One: Translation and Adaption Process

In phase one, translation of the original Chinese version of CCMQ, which originated from China into English. First, the forward translation process (Chinese to English) was conducted by one academic TCM practitioner. Then another academic TCM practitioner was appointed to identify any ambiguities and discrepancies in the words, sentences, grammar, and meaning. Lastly, the translated version was given to three independent native English speakers. All were never seen the original version of CCMQ. They were appointed to determine their understanding of the English version.

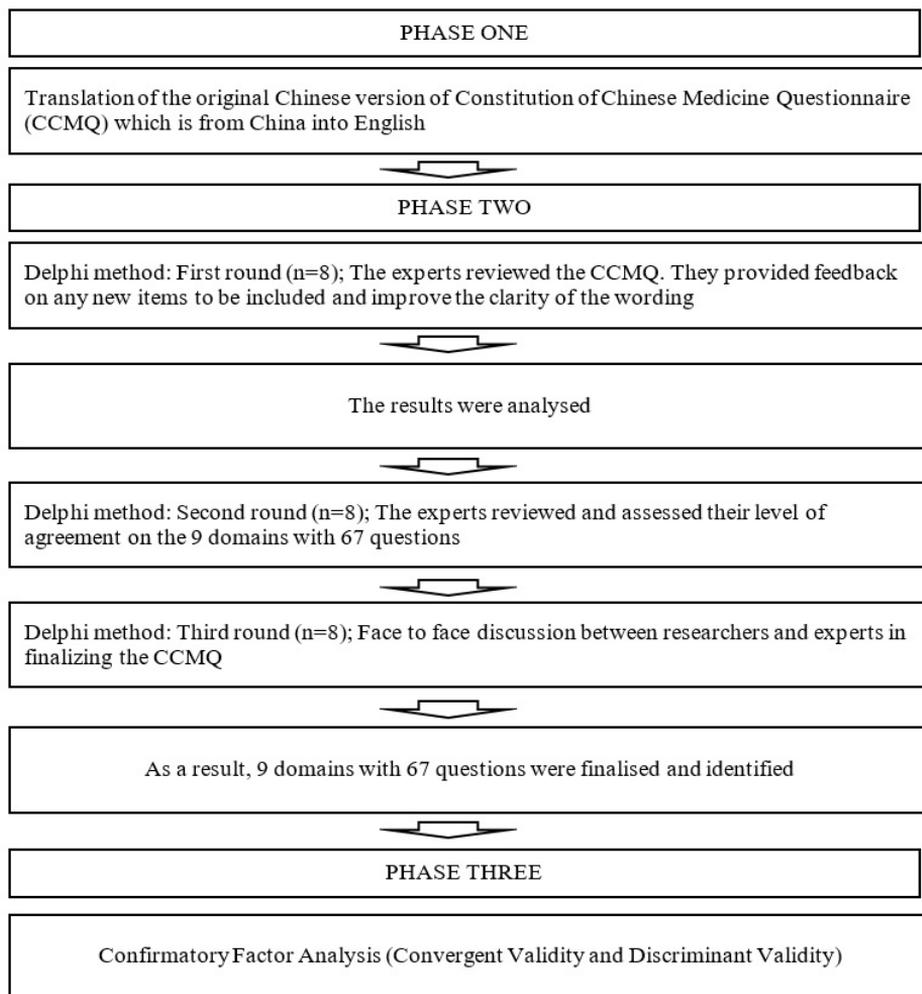


Figure 1: Study flow for the cultural adaptation and validation of the English version Constitution of Chinese Medicine questionnaire (CCMQ)

Phase Two: Delphi Technique

In Phase Two, the Delphi method was used to obtain and synthesise the CCMQ which originated from China. Email invitations were sent to eight experts, consisting of five TCM practitioners and three academic TCM practitioners. The experts were invited to fill in their demographic characteristics, qualifications and experiences in traditional medicine

practices. They are required to review the CCMQ by answering the following open-ended questions i.e. “How many domains you suggested in the CCMQ?”, “What is in the domain and questions in the CCMQ?”, “Any additional questions to the domain in the CCMQ which has not been included?”. All the sent emails were followed-up by the researchers. Experts were required to complete the first round of Delphi within two weeks.

The results from the first round were compiled and organised. Any repeated additional questions were eliminated, any suggestions on amending the word in the instrument were taken notes and amended.

In the second round, the instrument was sent to the same experts to review and assessed their level of agreement with the questions in each main domain using a five-point Likert scale. Competency ranking on a scale of 1 (strong disagreement) to 5 (strong agreement), mean scores were above 4 (i.e. agree or strongly agree) and were within the acceptable interquartile range (IQR) (Von der Gracht 2012).

In the third round, a face-to-face discussion was conducted by the researchers with the same expert to confirm the content validity of the competency items which will be surveyed in phase two (factor analysis). The experts reconfirmed and strongly agreed the outcome.

Phase Three: Confirmatory Factor Analysis (Convergent Validity and Discriminant Validity)

Data collected were analysed using partial least square (PLS) software SMART PLS 3.0. This is for the confirmatory factor analysis to determine the pilot test instrument's reliability and validity. The reliability and validity were tested through internal consistency reliability, indicator reliability, convergent validity and discriminant validity. The study process was shown in the diagram (Figure 1).

Funding

This research was supported by the Universiti Tunku Abdul Rahman Research Fund (UTARRF), (Project number IPSR/RMC/UTARRF/2019-C2/F01).

Ethical statement

The study was conducted according to the Declaration of the UTAR Research Ethics and Code of Conduct guidelines, Code of Practice for Research Involving Humans, and approved by the UTAR Scientific and Ethical Review Committee (SERC) (U/SERC/50/2020).

RESULTS

During the first round of phase two study using the Delphi method, the experts agreed and supported that CCMQ was classified into nine domains with a total of 67 questions, which were similar to the original CCMQ. However, some of the questions were rephrased; Domain 1 - Balanced Constitution consisted of 8 questions (2 questions were rephrased); Domain 2 - Qi Deficiency Constitution consisted of 8 questions (3 questions were rephrased); Domain 3 - Yang Deficiency Constitution consisted of 7 questions (2 questions were rephrased); Domain 4 - Yin Deficiency Constitution consisted of 8 questions (3 questions were rephrased); Domain 5 - Phlegm Damp Constitution consisted of 8 questions (2 questions were rephrased); Domain 6 - Damp-Heat Constitution consisted of 7 questions (3 questions were rephrased); Domain 7 - Blood Stasis Constitution

consisted of 7 questions; Domain 8 - Qi Stagnation Constitution consisted of 7 questions (2 questions were rephrased); and Domain 9 - Inherited-special Constitution consisted of 7 questions (Table 1).

In the second round of the Delphi method, all the questions exceeded the agreed consensus point mean of 4.72 and interquartile range of 0.63. The consensus was agreed occurring when at least 70 % of the respondents score 3.5 or more on the five-Likert

scale for each question. Thus, in this study, an interquartile range (IQR) of less than 1 meant that more than 50% of all opinions fell on a certain point on the scale; this showed that they had reached a consensus. An IQR of zero indicated a perfect consensus among panel members: the higher the IQR, the greater the dispersion of the data. The consensus point mean was shown in Table 2. As a result, the CCMQ was remained in the nine domains with a total of 67 questions (Table 2).

Table 1: The English version of CCMQ draft question and the final question

Domain	Draft Question	Final Question
Balanced Constitution	Do you feel unhappy?	Do you feel unhappy or feeling down?
	Do you experience insomnia?	Are you prone to insomnia?
Qi Deficiency Constitution	Are you nervous easily?	Are you easily flustered?
	Normally, do you get flu easily?	Are you more easily to catch a cold than others?
	Are you a quiet person?	Do you like to be quiet or lazy (reluctant) to talk?
Yang Deficiency Constitution	Are you afraid of cold especially in the stomach, back and knees?	Are you intolerant to cold in the stomach / back/ knee?
	Normally, do you get flu easily?	Are you more easily to catch a cold than others?
Yin Deficiency Constitution	Do your palms and feet feel hot?	Do you feel hot in your palms and soles?
	Do your body and face feel hot?	Do you feel hot on your body and face?
	Are you easily flushed?	Are your cheeks flushed or reddish?
Phlegm Damp Constitution	Do you feel uncomfortable in chest or bloating?	Do you feel distress in chest or abdominal distention?
	Do you usually have much phlegm and a feeling of difficulty in removing the phlegm?	Do you usually have excessive phlegm, especially in the throat?
Damp-Heat Constitution	Do you get pimples or boils on face easily?	Do you get pimples or boils (pus-filled lump) easily?
	Is your stool sticky and having incomplete pass motion?	Do you have sticky stool or feeling of incomplete bowel movement?
	Do you feel your scrotal parts wet? (FOR MALE)	Is your scrotum (private part) wet? (FOR MALE)
Qi Stagnation Constitution	Do you feel unhappy?	Do you feel unhappy or feeling down?
	Do you feel upper abdominal pain and bloated around rib cage or swelling and pain in your breast?	Do you feel distending pain around flank (lower armpit) or chest/breast?

Table 2: Mean and interquartile range (IQR) for the nine types of TCM body constitutions

Domain	Mean	Number of questions	IQR
Balanced Constitution	4.64	8	0.66
Qi Deficiency Constitution	4.67	8	0.84
Yang Deficiency Constitution	4.70	7	0.71
Yin Deficiency Constitution	4.78	8	0.59
Phlegm Damp Constitution	4.80	8	0.41
Damp Heat Constitution	4.82	7	0.36
Blood Stasis Constitution	4.68	7	0.75
Qi Stagnation Constitution	4.59	7	0.86
Inherited Special Constitution	4.80	7	0.54

In the third round, the researchers met all the experts face-to-face in the final checking on the questions even though round 2 demonstrated a high consensus. All eight experts agreed upon the domains and questions. The agreed CCMQ classification was then tested in the phase three for confirmatory factor analysis.

Table 3 summarised all the assessments performed on internal consistency, indicator reliability and convergent validity. Table 3 showed all the nine domains of composite reliability (CR) value are more than 0.70, indicating CCMQ had good

and satisfactory internal consistency reliability and average variance extracted (AVE) value of more than 0.5 demonstrated an acceptable convergent validity.

Table 4 showed the heterotrait-monotrait ratio of correlations (HTMT) to assess discriminant validity. The HTMT ratio value for all the domains is below 0.90, which fulfilled the criteria of discriminant validity.

DISCUSSION

The original CCMQ was in the Chinese version and has also been translated

Table 3: Reliability and validity of the instrument

No	Variable	No of item	AVE	CR
1	Domain 1 – Balanced Constitution	8 (1-8)	0.689	0.869
2	Domain 2 – Qi Deficiency Constitution	8 (9-16)	0.647	0.879
3	Domain 3 – Yang Deficiency Constitution	7 (17-23)	0.689	0.869
4	Domain 4 – Yin Deficiency Constitution	8 (24-31)	0.712	0.908
5	Domain 5 – Phlegm Damp Constitution	8 (32-39)	0.647	0.879
6	Domain 6 – Damp Heat Constitution	7 (40-46)	0.689	0.869
7	Domain 7 – Blood Stasis Constitution	7 (47-53)	0.712	0.908
8	Domain 8 – Qi Stagnation Constitution	7 (54-60)	0.764	0.906
9	Domain 9 – Inherited Special Constitution	7 (61-67)	0.712	0.908

Table 4: Heterotrait-monotrait ratio of correlations for the instrument

	Balanced	Damp Heat	Qi Deficiency	Inherited Special	Yin Deficiency	Blood Stasis	Phlegm Damp	Qi Stagnation
Damp Heat	0.151	-	-	-	-	-	-	-
Qi Deficiency	0.249	0.36	-	-	-	-	-	-
Inherited Special	0.181	0.207	0.212	-	-	-	-	-
Yin Deficiency	0.23	0.322	0.578	0.268	-	-	-	-
Blood Stasis	0.198	0.238	0.521	0.222	0.652	-	-	-
Phlegm Damp	0.167	0.432	0.378	0.401	0.348	0.296	-	-
Qi Stagnation	0.306	0.237	0.428	0.155	0.374	0.279	0.253	-
Yang Deficiency	0.222	0.182	0.557	0.267	0.416	0.523	0.228	0.268

into Japanese, Korean and English versions (Wang 2005; Zhu 2008; Li et al. 2015; Jing et al. 2018). The CCMQ was carried out for the Malaysian population. It needs to be culturally adapted and validated in the target language. This study reported the validity, reliability and feasibility of self-administered Malaysia’s English version of CCMQ which was conducted on the types of body constitution among young adults in Malaysia. All the nine domains in CCMQ demonstrated CR values of more than 0.70, AVE values of more than 0.5 and HTMT values of below 0.90. This indicated that CCMQ had good and satisfactory internal consistency reliability, convergent validity and discriminant validity, respectively. The results obtained from this study were similar to the results obtained from numerous international validations studies (Zhu et al. 2008; Wong et al. 2013; Li et al. 2015).

There are limited validated

healthcare questionnaires in Chinese medicine even though it has been playing important role in prevention and treatment in China for 5000 years (Dong 2013). To broaden the usage and application of Chinese medicine to foreigners, the English-validated version of CCMQ was validated by American and Canadian (aged 15 to 71 years old) in Beijing (Jing et al. 2018). Due to the targeted group, culture and geographical differences, our validation study’s questionnaire word had been rephrased to cope with the understanding of young adults in Malaysia.

The current validated CCMQ can be used as a predictive medicine tool by TCM practitioners for disease diagnosis and by researchers to conduct research in syndrome differentiation and prevention medicine studies. Through the application of CCMQ, the individualised body constitution is a way to improve the health literacy of

Malaysians. It could be the protective and preventive factor to recognise and manage a person's health status (Ye et al. 2019).

The targeted sample size of 114 was achieved to ensure adequate power for convergent and discriminant validity. However, the limitation of this study is the subject recruitment is mainly focused on young adults in Malaysia. We aimed to optimise the response rate from different populations in future studies.

CONCLUSION

This current statistically validated English version of the CCMQ can be considered as a valid and reliable instrument and can be applied to the young adult population in Malaysia.

ACKNOWLEDGEMENT

The authors declare no conflicts of interest. The authors would like to express sincere gratitude to the TCM experts (Mr. Pang Jit Ken, Mr. Lock Wut Kean, Ms. Kong Ho Leh, Mr. Yek Shih Cherng, Ms. Tee Jing Xuan, Dr. Teh Lai Kuan, Dr. Pang Jit Seng and Ms. Sara Low Leng Keng) to review and assess the questionnaire. Sincere thanks go to all the participants in this study.

REFERENCES

- Chen, S.L., Liu, Y.T., Hsueh, K.C., Tang, P.L. 2021. Body constitution of traditional Chinese medicine caused a significant effect on depression in adult women. *Complement Ther Clin Pract* **42**: 101288.
- Chong, T.F., Ser, X.E., Ooi, L.K., Wong, L.S. 2018. Body constitution and dysmenorrhea: a study on university students in Malaysia. *Orient Pharm Exp Med* **18**(4): 377-80.
- Deng, X., Teng, J., Nong, X., Yu, B., Tang, L., Liang, J., Zou, Z., Liu, Q., Zhou, L., Li, Q., Zhao, L. 2021. Characteristics of TCM Constitution and Related Biomarkers for Mild Cognitive Impairment. *Neuropsychiatr Dis Treat* **17**: 1115-24.
- Department of Statistics Malaysia, 2022. Department of Statistics Malaysia Official Portal. https://www.dosm.gov.my/v1/index.php?r=column/cthemByCat&cat=401&bul_id=R3VrRUhwSXZDN2k4SGN6akRhTStwQT09&menu_id=L0pheU43NWJwRWVSZkRWdzQ4TlhUUT09. [18 August 2022]
- Dong, J. 2013. The relationship between traditional Chinese medicine and modern medicine. *Evid Based Complement Alternat Med* **2013**: 1-10.
- Han, S.H., Li, K.Z., Zheng, J.M., Zheng, Z.X., Lin, M.C., Xu, M.Y., Yue, Z.C. 2013. Study on the distribution of Chinese medical constitutions of hypertension complicated diabetes patients. *Chin J Integr Med* **33**(2): 199-204.
- Hou, H.I., Chen, H.Y., Lu, J.J., Chang, S.C., Li, H.Y., Jiang, K.H., Chen, J.L. 2021. The relationships between leptin, genotype, and Chinese medicine body constitution for obesity. *Evid Based Complement Alternat Med* **2021**: 5510552.
- Jing, H.R., Wang, J., Wang, Q. 2018. Study on the Performance Evaluation of the English Version of Tcm Constitution Scale. *Chin J Basic Med Trad Chin Med* **24**(01): 42-5.
- Jorm, A.F. 2015. Using the Delphi expert consensus method in mental health research. *Aust N Z J Psychiatry* **49**(10): 887-97.
- Li, B.M., Cao, H.J., Tian, E.H., Wang, Q. 2015. A cross-sectional study of a Korean population using the standardized constitution in Chinese medicine questionnaire (Korean Version). *J Anhui Univ Chin Med* **34**(04): 25-8.
- Li, L., Yao, H., Wang, J., Li, Y., Wang, Q. 2019. The role of Chinese medicine in health maintenance and disease prevention: Application of constitution theory. *Am J Chin Med* **47**(3): 495-506.
- Li, L., Wang, Z., Wang, J., Zheng, Y., Li, Y., Wang, Q. 2020a. Enlightenment about using TCM constitutions for individualized medicine and construction of Chinese-style precision medicine: research progress with TCM constitutions. *Sci China Life Sci* **64**(12): 2092-9.
- Li, Y.H., Aslam, M.S., Yang, K.L., Kao, C.A., Teng, S.Y. 2020b. Classification of body constitution based on TCM philosophy and deep learning. *Symmetry* **12**(5): 803.
- Liang, X., Wang, Q., Jiang, Z., Li, Z., Zhang, M., Yang, P., Wang, X., Qin, Y., Li, T., Zhang, T., Wang, Y., Sun, J., Li, Y., Luo, H. 2020. Clinical research linking Traditional Chinese Medicine constitution types with diseases: a literature review of 1639 observational studies. *J Tradit*

- Chin Med* **40**(4): 690-702.
- Liao, Y., Chen, L., Wang, H., Lin, J., Lin, T., Lin, S. 2021. The association between traditional Chinese medicine body constitution deviation and essential hypertension: a case-control study. *J Nurs Res* **29**(4): e160.
- Liu, L., Yin, Z., Ma, J., Duan, S., Chen, X. 2019. Potential Association of Body Constitution with the Prognosis of IgA Nephropathy: A Long-Time Follow-Up of 203 Cases in China. *Evid Based Complement Alternat Med* **2019**: 6289478.
- Liu, Y., Pan, T., Zou, W., Sun, Y., Cai, Y., Wang, R., Han, P., Zhang, Z., He, Q., Ye, F., 2016. Relationship between traditional Chinese medicine constitutional types with chemotherapy-induced nausea and vomiting in patients with breast cancer: an observational study. *BMC Complement Altern Med* **16**(1): 451.
- Low, C.T., Lai, P.C., Li, H.D., Ho, W.K., Wong, P., Chen, S., Wong, W.C. 2016. Neighbourhood effects on body constitution-A case study of Hong Kong. *Soc Sci Med* **158**: 61-74.
- Ma, K., Chen, J., Kuang, L., Bi, J., Cheng, J., Li, F., Sun, X., Nie, X., Liu, Y., Luo, R., Zhao, X. 2018. Qi-deficiency related increases in disease susceptibility are potentially mediated by the intestinal microbiota. *Evid Based Complement Alternat Med* **2018**: 1304397.
- Sun, Y., Zhao, Y., Xue, S.A., Chen, J. 2018. The theory development of traditional Chinese medicine constitution: a review. *J Tradit Chin Med Sci* **5**(1): 16-28.
- Vollmann, R., Wooi, S.T. 2019. The sociolinguistic status of Malaysian English. *Grazer Linguistische Studien* **91**: 133-50.
- Von der Gracht, H.A., 2012. Consensus measurement in Delphi studies. Review and implications for future quality assurance. *Technol Forecast Soc Change* **79**(8): 1525-36.
- Wang, J., Wang, Q., Li, L., Li, Y., Zhang, H., Zheng, L., Yang, L., Zheng, Y., Yang, Y., Peng, G., Zhang, Y., Han, Y. 2013. Phlegm-dampness constitution: genomics, susceptibility, adjustment and treatment with traditional Chinese medicine. *Am J Chin Med* **41**(2): 253-62.
- Wang, J., Wang, T., Li, Y.S., Zheng, Y.F., Li, L.R., Wang, Q. 2015. Research on constitution of Chinese medicine and implementation of translational medicine. *Chin J Integr Med* **21**(5): 389-93.
- Wang, Q. 2005. Classification and diagnosis basis of nine basic constitutions in Chinese medicine. *J Beijing Univ Tradit Chin Med* **28**(4): 1-8.
- Wang, Q. 2012. Individualized medicine, health medicine, and constitutional theory in Chinese medicine. *Front Med* **6**(1): 1-7.
- Wong, W., Lam, C.L.K., Wong, V.T., Yang, Z.M., Ziea, E.T.C., Kwan, A.K.L. 2013. Validation of the constitution in Chinese medicine questionnaire: Does the traditional Chinese medicine concept of body constitution exist? *Evid Based Complement Alternat Med* **2013**: 481491.
- Wu, Y., Cun, Y., Dong, J., Shao, J., Luo, S., Nie, S., Yu, H., Zheng, B., Wang, Q., Xiao, C. 2010. Polymorphisms in PPAR α , PPAR γ and APM1 associated with four types of traditional Chinese medicine constitutions. *J Genet Genomics* **37**(6): 371-9.
- Yang, Y.Y., Yang, F.Q., Gao, J.L. 2019. Differential proteomics for studying action mechanisms of traditional Chinese medicines. *Chin Med* **14**(1): 1.
- Yap, S.Y., Foo, C.N., Lim, Y.M., Ng, F.L., Mohd-Sidik, S., Tang, P.Y., Singh, J.K.N., Pheh, K.S. 2021. Traditional Chinese Medicine Body Constitutions and Psychological Determinants of Depression among University Students in Malaysia: A Pilot Study. *Int J Environ Res Public Health* **18**(10): 5366.
- Yap, S.Y., Ng, F.L., Subramaniam, M., Lim, Y.M., Foo, C.N. 2022. Traditional Chinese medicine body constitutions as predictors for depression: a systematic review and meta-analysis. *Behav Sci* **12**(11): 423.
- Ye, H., Chen, J., Xu, G., Liu, J. 2019. Standardized Auricular Therapy for Patients with Different Constitutions and Suboptimal Health: A Retrospective Study. *Med Acupunct* **31**(2): 98-102.
- Yu, R., Liu, D., Yang, Y., Han, Y., Li, L., Zheng, L., Wang, J., Zhang, Y., Li, Y., Wang, Q.F., Wang, Q. 2017a. Expression profiling-based clustering of healthy subjects recapitulates classifications defined by clinical observation in Chinese medicine. *J Genet Genomics* **44**(4): 191-7.
- Yu, W., Ma, M., Chen, X., Min, J., Li, L., Zheng, Y., Li, Y., Wang, J., Wang, Q. 2017b. Traditional Chinese Medicine and Constitutional Medicine in China, Japan and Korea: A Comparative Study. *Am J Chin Med* **45**(1): 1-12.
- Zhang, C., Li, L., Cheng, S., Chowdhury, D., Tan, Y., Liu, X., Zhao, N., He, X., Jiang, M., Lu, C., Lyu, A. 2021a. Weight changes in hypertensive patients with phlegm-dampness syndrome: an integrated proteomics and metabolomics approach. *Chin Med* **16**(1): 54.
- Zhang, T., Luo, H., Wei, D., Xie, X., Yang, C., Liu, B., Gao, Y. 2021b. Traditional Chinese Medicine Constitution Correlated with Ischemic Stroke: A Systematic Review and Meta-Analysis. *Evid Based Complement Alternat Med* **2021**: 5524925.
- Zhang, Z., Chuang, Y., Ke, X., Wang, J., Xu, Y., Zhao, Y., Bian, Y. 2021c. The influence of TCM constitutions and neurocognitive function in elderly Macau individuals. *Chin Med* **16**(1): 32.
- Zhu, Y.B., Wang, Q., Hideki, O. 2007. Evaluation on reliability and validity of the constitution in Chinese medicine questionnaire (CCMQ). *Chin*

- J Behav Med Sci* **16**(7): 651-4.
- Zhu, W. 2008. *Study of Syndrome Elements Differentiation*. Beijing: People's Medical Publishing House.
- Zhu, Y., Origasa, H., Uebaba, K., Xu, F., Wang, Q., 2008. Development and validation of the Japanese version of the constitution in Chinese medicine questionnaire (CCMQ). *Kampo Med* **59**(6): 783-92.
- Zhu, Y., Shi, H., Wang, Q., Wang, Y., Yu, X., Di, J., Zhang, X., Li, Y., Li, T., Yan, H., 2017. Association between nine types of tcm constitution and five chronic diseases: a correspondence analysis based on a sample of 2,660 Participants. *Evid Based Complement Alternat Med* **2017**: Article ID **9439382**.

Received: 24 Aug 2022

Accepted: 04 Nov 2022