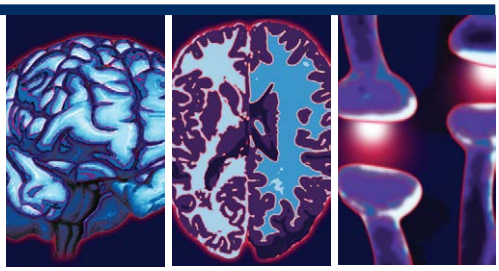

Validation of a Short Chinese (45-Item) TEMPS-A in a Non-Clinical Chinese Population

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Abstract

Objectives:

We previously validated the 110-item Chinese TEMPS-A in a relatively large Chinese population, on the basis of which this study was aimed at validating a short Chinese TEMPS-A in order to facilitate its wide use in time-limited settings such as out-patient clinics.

Method:

We extracted 63 items from the 110-item TEMPS-A with factor loading ≧0.35. The reconstructed 63-item Chinese TEMPS-A was administered to 879 clinically-well Chinese Han population aged 16-60 years without a history of mental disorders.

Results:

A principal component analysis with Varimax rotation found that 45 out of the 63 items loaded onto five factors, namely cyclothymic, hyperthymic, anxious, irritable, and depressive factors. The Cronbach alphas coefficients were 0.86 (cyclothymic), 0.80 (hyperthymic), 0.57 (anxious), 0.55 (irritable), and 0.62 (depressive). Most of the affective temperaments were significantly correlated with one another. The males scored significantly higher on the hyperthymic and irritable subscales than did the females. Finally, the frequency of the dominant temperaments (defined as two standard deviations above the mean) was the highest for the depressive temperament (6.0%), followed by the cyclothymic, anxious (4.2%), irritable (2.8%), and hyperthymic (0%) temperaments.

Conclusions:

Our data suggest that the 45-item Chinese TEMPS-A is psychometrically comparable to its full version. Further refinement (i.e combining all the somatic symptom items) warrants future investigation.

Keywords:

Affective temperament, TEMPS-A, Chinese population, Mandarin, Short version

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Introduction

Affective temperament is of increasing interest to psychologists and psychiatrists, not only for the better understanding of human behavior but also for unraveling the underlying mechanisms of mood dysregulation. The concept of affective temperaments was originally defined by Kretschmer [1] and further elaborated by Akiskal and colleagues [2]. More recently, a self-rate instrument, namely the Temperament Evaluation of Memphis Pisa Paris and SanDiego-Autoquestionnaire (TEMPS-A), was developed to assess the five affective temperaments, including depressive, hyperthymic, cyclothymic, irritable and anxious temperaments [3].

The TEMPS-A so far has been translated and validated in more than 25 languages, including its Chinese version [4-6]. An increasing body of evidence suggests interwoven relations between the affective temperaments measured by the TEMPS-A and affective disorders. For instance, hyperthymic temperament was overrepresented in individuals with bipolar I disorder, whereas cyclothymic temperament was overrepresented in individuals with bipolar II disorder [7]. Moreover, bipolar II patients with cyclothymic temperament were more likely to have a younger age of onset and higher rate of psychiatric comorbidities when compared with those without the temperament [8]. In bipolar I cases, those with cyclothymic temperament had more episodes of depression and hypomania, as well as suicide attempts when compared with those with hyperthymic temperament [9]. In a sample of unipolar and bipolar patients, more than 92% patients with cyclothymic temperament reported suicidal ideation [10]. Furthermore, bipolar patients with hyperthymic temperament performed significantly worse on the cognitive domains of set shifting and verbal working memory when compared with those without the temperament [11]. Finally, affective temperaments were associated with aggressive behavior (i.e. prominent cyclothymic temperament) and concomitant alcohol misuse (the hyperthymic and irritable temperaments) in bipolar patients [12,13], and served as predictors for illness severity and psychosocial functioning in patients with major mood disorder [14].

We previously validated the Chinese 110-item TEMPS-A (full-version) in a clinically-well Chinese population [4], and applied it in different clinical populations to investigate the impact of affective temperaments on cognitive deficits [11]. Subsequently a Chinese short version, translated from the 39-item English TEMPS-A [15] was developed by Yuan, *et al.*[16]. However, a few items were culturally-determined. For instance, item 19 ("I'm the kind of person who doubts everything"), item 81("I am a very skeptical person") and item 66 ("I complain a lot") that loaded on the depressive temperament may not be applicable to the Chinese culture [4]. This observation was supported by a traditional Chinese version of TEMPS-A based on the Hong Kong Cantonese culture [17]. Moreover, some items had relatively low factor loading (<0.35) compared to the original English version [18], e.g "My sex drive has always been low." and some items loaded on more than one factors to various degrees [4]. Yet, despite the number and content of the items in some short versions varied, the five-factor structure as described above was observed in different cultures including the Chinese [5,15-17].

Therefore, we attempted to validate a short Chinese version of the TEMPS-A in a large non-clinical population while taking into consideration the Chinese culture, with the additional aim to only incorporate items that load highly and specifically on one of the 5 factors of the Chinese full-version [4].

Method

■ Design of the study and measures

The Guangzhou Brain hospital in collaboration with senior author Akiskal at the International Mood center translated and validated the 110-item (full-version) Chinese TEMPS-A [4]. The full-version TEMPS-A consists of 110 items (yes/no questions) assessing depressive (items 1-21), cyclothymic (items 22-42), hyperthymic (items 43-63), irritable (items 64-84), and anxious (items 85-110) temperaments [3]. To develop a short Chinese TEMPS-A, we first extracted items that had factor loading≧0.35 on the 110-item Chinese TEMPS-A. The extracted items were then reviewed by the two authors of this study (G. Xu and K. Lin), and items that may not be applicable to the Chinese culture were then removed (i.e. item 4 and 14). The resulting 63-item TEMPS-A was composed of the depressive (11 items), cyclothymic (11 items), hyperthymic (13items), irritable (12 items), and anxious (16 items) subscales.

■ Participants

Participants were recruited from March 2013 to December 2013 in four districts of Guangzhou,

China (i.e. Baiyun, Haizhu, Yuexiu, and Liwan districts). Guangzhou was a relatively well-developed city where people from all over China came here to study and work, thus the participants could be considered originating from different parts of China. All of the participants were Chinese Han. Participants were recruited through advertisement posted in two local universities and four communities in the above districts. Participants aged between 16-60 who did not have personal or family history of mental disorders were eligible. The study excluded those with self-reported mental disturbance, or a personal or family history of mental disorder, as the aim of this study was to validate the short TEMPS-A in a non-clinical Chinese population. Participants completed the questionnaire in their classrooms or community health centres. Before distributing the questionnaire, a trained interviewer stated the purpose of this study ("to understand temperaments in Chinese Han population") and delivered the instruction for the TEMPS-A to the participants. Demographic data on gender, age, occupational status, marital status and educational attainment were collected alongside the questionnaire data. The study was approved by the Ethics Committee of the Guangzhou Brain hospital. All of the participants gave written informed consent.

From March 2013 to December 2013, the 63-item TEMPS-A was distributed to 1038 clinically-well Chinese subjects. There was no planned calculation of sample size. 105 participants did not finish the questionnaire. As a quality control, four repeated items were inserted into the questionnaire and those who gave more than three contradictory answers on those items were excluded from the final analyses (n=54). Thus, the final sample consisted of 879 subjects with a mean age of 23.12 (standard deviation (SD)=7.54) years. 581 (66.1%) were female with a mean age of 22.23 (SD=6.73) years. 631(71.79%) subjects were college students and 248(28.21%) were on employment. As for marital status, 81.3% of the total samples were single, and 18.7% married. As for education, 5(0.6%) subjects had their highest level of education to be at elementary school level; 191(21.7%) had finished high school; and 683(77.7%) had either completed college or were completing college.

Statistical analyses

All of the data were analyzed with the Statistical Package for Social Sciences Software version 20. Factor analysis was applied using principal component analysis (PCA) and varimax rotation. Reliability was measured by Cronbach's–Alpha coefficient. Correlations between subscales were calculated using Pearson bivariate correlation analysis. All tests were 2-tailed, with significance level set at $p<0.05$. Chi-squared tests were carried out on the percentage of individuals scoring above 2SD between females and males.

Result

■ Constructing a 45-itemTEMPS-A

At first, we factor-analysed the 63 items using PCA and Varimax rotation. To further shorten the TEMPS-A, items were retained only if they loaded greater than 0.4 on one factor and only on that factor; 17 items that had factor loadings less than 0.40 were removed. The resulting 46 items were subjected to another PCA followed by Varimax rotation. As shown in Table 1, five factors were identified, explaining 35.12% of the total variance.

The first factor accounted for 11.63% of the variance with an eigenvalue of 5.35, consisting of 17 items (D7,D13,A86,A87,A88,A89,I64,I70, C22,C23,C27,C28,C29,C30,C35,C38,C39). Because the strongest loading items were from the cyclothymic scale, we labelled this factor as cyclothymic. The second factor, accounting for 8.72% of the variance with an eigenvalue of 4.01, was defined by 13 hyperthymic items (H43,H44,H45,H47,H48,H50,H51,H52, H53,H54,H55,H58,H60), and was labelled as hyperthymic. The third factor, accounting for 5.34% of the variance with an eigenvalue of 2.46, was comprised of 6 anxious items (A91,A94,A95, A96,A105, and A106) and one irritable item(I78). We labelled this factor as anxious.

The fourth factor, accounting for 4.81% of the variance with an eigenvalue of 2.21, was defined by five irritable items (I67, I72, I77, I79, I80), and was labelled as an irritable factor. We deleted Item I80 ("I have been told that I become violent with just a few drinks") not only because of its low factor loading (0.377), but also that drinking was not common for females in the Chinese culture.

Finally, the fifth factor accounted for 4.62% of the variance with an eigenvalue of 2.13. It consisted of three depressive items (D1, D2, and D6) and one cyclothymic item (C33), and could be considered as a depressive factor.

In addition, for exploratory purpose we re-analyzed the data by excluding the anxious temperament subscale. The result showed that the four-factor structure-cyclothymic, hyperthymic, irritable and depressive temperaments-was maintained.

■ Reliability

The internal consistency of the whole TEMPS-A was good (α=0.81).The Cronbach–Alpha coefficients for the cyclothymic, hyperthymic, irritable, anxious, and depressive temperaments subscales were 0.86, 0.80, 0.55, 0.57, and 0.62, respectively.

■ Correlations between the subscales

The correlations among the five temperament subscales were shown in **Table 2**. Most of the temperament subscales were associated with each other. The strongest positive correlation was observed between the cyclothymic and anxious temperaments (r=0.54). No correlation between the irritable and hyperthymic temperaments was found (p>0.05).

■ Gender difference in temperament scores

Table 3 shows the mean scores of each temperament subscale divided by gender. The males scored significantly higher than did the females on the hyperthymic and irritable subscales (t=4.31, $p<0.001$; t=2.18,$p<0.05$, respectively). No significant differences in the other four temperaments were found **(Table 3)**.

■ Distribution of Z-scores

In order to describe the distribution of dominant temperaments, we calculated the Z-scores above +1SD and +2SD. Dominant temperament for each subscale was defined as two standard deviations above the mean. As shown in **Table 4**, the frequency of dominant temperament was the highest for the depressive temperament (6.0%), followed by the cyclothymic (4.6%), anxious (4.2%), and irritable (2.8%) temperaments. No dominant hyperthymic temperament was observed (0%). The frequency of dominant depressive and irritable temperaments in the males was significantly higher than that in the females ($\chi2=13.35$, $p<0.001$;$\chi2=5.78$, $p<0.05$, respectively). The frequencies of the dominant temperaments including cyclothymic, hyperthymic and anxious were not significantly different between genders **(Figure 1)**.

Table 1: Factor structure of the reconstituted short version (45-item) of the Chinese TEMPS-A.

Factor I		Factor II		Factor III		Factor IV		Factor V	
C29	0.662	H51	0.656	A95	0.534	I72	0.621	D1	0.667
C23	0.659	H48	0.637	A94	0.531	I67	0.505	D6	0.620
C30	0.604	H52	0.613	A96	0.465	I79	0.410	D2	0.558
I70	0.571	H55	0.585	A106	0.439	I64	0.378	C33	0.510
C38	0.566	H58	0.575	I78	0.430	I78	0.355		
A86	0.546	H54	0.555	A105	0.423				
C27	0.541	H47	0.515	A91	0.419				
A87	0.525	H44	0.509						
A88	0.522	H45	0.508						
C22	0.516	H50	0.499						
C28	0.506	H43	0.476						
D7	0.501	H53	0.470						
D13	0.486	H60	0.416						
C39	0.471								
C35	0.468								
A89	0.468								
I64	0.393								

D=Depressive, C=Cyclothymic, H=Hyperthymic, I=Irritable, A=Anxious

Table 2: Pearson correlations among the five temperaments.

Temperaments	Cyclothymic	Hyperthymic	Irritable	Anxious
Depressive	0.500**	-0.205**	0.321**	0.455**
Cyclothymic		-0.106**	0.451**	0.540**
Hyperthymic			-0.014	-0.093*
Irritable				0.484**

**. $p<0.01$ *.$p<0.05$

Table 3: Mean scores of each temperament by gender.

Scale	Males*	Females*	T	*p*
Depressive	1.01(1.09)	0.96(0.88)	0.726	0.468
Cyclothymic	3.28(2.71)	3.36(2.68)	-0.459	0.646
Hyperthymic	7.57(3.54)	6.52(3.34)	4.309	0.000
Irritable	1.44(1.64)	1.21(1.21)	2.182	0.030
Anxious	2. 31(2.33)	2.29(2.13)	0.114	0.909
Note: *data were shown in Mean (SD)				

Table 4: The distribution of Z scores on each temperament.

Temperament	All (n=879) N(%)		Male (n=297)		Female (n=581)	
	+1SD	+2SD	+1SD	+2SD	+1SD	+2SD
Depressive	219(24.9)	53(6.0)	81(27.2)	26(8.7)	138(23.8)	27(4.6)
Cyclothymic	128(14.6)	40(4.6)	43(14.4)	15(5.0)	85(14.6)	25(4.3)
Hyperthymic	168(19.1)	0(0)	82(27.5)	0(0)	86(14.8)	0(0)
Irritable	148(16.8)	25(2.8)	59(19.8)	17(5.7)	89(15.3)	8(1.4)
Anxious	156(17.7)	37(4.2)	54(18.1)	14(4.7)	102(17.6)	23(4.0)

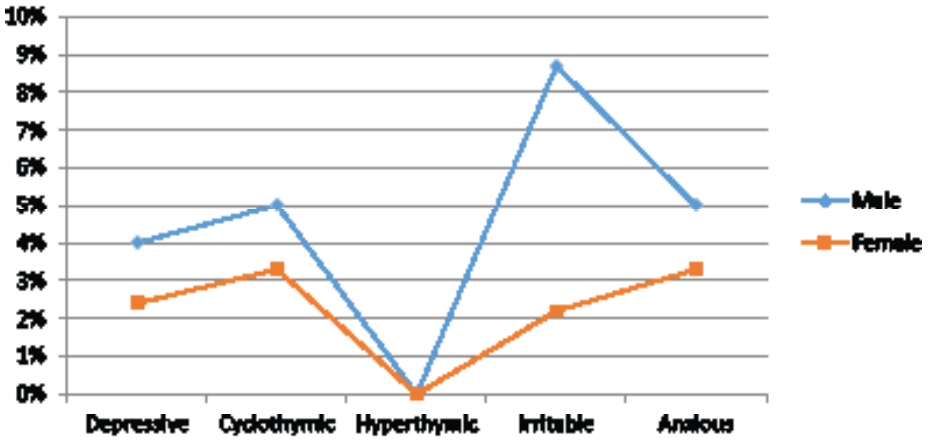

Figure 1: The gender differences in the frequency of the dominant temperaments (z-scores above +2S.D).

Discussion

We constructed the present 45-item Chinese TEMPS-A (Appendix 1) by excluding items that were not culturally applicable to the Chinese population and items that had low factor loading on its predecessor (the full version). Items with low factor loading (<0.35) had tendency to load on more than one factors; and the validity of such items in measuring their respective temperament in the full Chinese version of TEMPS-A may be thus questionable.[4] Similar cases were also observed while validating the original English version (e.g. item 2 "People tell me I am unable to see the lighter side of things" loaded 0.34 on the irritable and 0.35 on the depressive temperament) [18]. The present study excluding items with low factor loading may help minimize these issues.

From a psychometric perspective, the main goal of the present study was to assess the factorial structure of the short TEMPS-A. It reconfirmed the five-factor structure. In the present short Chinese version, 4 items from the anxious subscale which measure worrying tendency (i.e. item 86, 87,88, and 89) loaded onto the cyclothymic factor, while the items of the anxious subscale characterizing physical symptoms (i.e. item 91, 94, 95, 96, 105 and 108) emerged as a separate factor. The latter was labelled as "nervous temperament" in the Turkish TEMPS-A [19]. Similar findings were also seen in other cultures, including Brazilian [20] and Lebanese-Arabic [21]. In viewing the development of the original TEMPS-A, the anxious subscale was added last to the other four already validated subscales [3]; as described above, "somatic anxiety" emerged as a distinct factor, and some worry items clustered with the depressive temperament [18]. The present study found that the worry items along with two depressive items (item D7 and D13)

loaded onto the cyclothymic subscale, which was observed in the Italian (Rome) version as well, analogous to the neuroticism factor in the Eysenck Personality Inventory as the authors suggested [22]. We found 27% individuals who had dominant anxious temperament met the criteria of dominant cyclothymic temperament (data not shown), suggesting the two temperaments were closely associated. Given strong correlations of cyclothymic and anxious reactivity temperaments with bipolar disorder [23], it may not be surprising to see those temperaments correlating with each other. A recent meta-analysis of the TEMPS-A found a continuum of cyclothymic and anxious temperaments that started from healthy controls at the low end, through to relatives of bipolar patients, and to bipolar patients themselves at the high end [5].

In the 110-item Chinese (Mandarin) TEMPS-A, a few worry items did overlap with the cyclothymic temperament, but they at the same time loaded comparably heavily on the anxious temperament [4]. In a Hong Kong Cantonese population—which might be considered as a major subculture of China-Leung, *et al.* found that the depressive, cyclothymic, and worry items aggregated together to form a similar combined factor, which nonetheless was not seen in its short Cantonese version (43-item) [17].

Compared to the 110-item Chinese TEMPS-A, the present 45-item version displayed low internal consistency on the irritable (0.55) and anxious (0.57) subscales. It is partly due to a small number of items in those subscales. Moreover, items that overlapped in content were excluded, thus compromising the relatedness between items. Furthermore, though the anxious items (A94, A95, A96, A105, and A106) all pertained to the physical symptoms of anxiety, their contents were largely diverse, encompassing the cardiovascular, digestive functioning and central and peripheral systems. Hence, individuals would tend to endorse some, but not all, of the physical symptoms, which reduced their internal consistency. Compared to the 39-item Chinese version, which had high internal consistency ranged from 0.7 to 8.9, the present version had relatively low internal consistency and included fewer depressive items.

As expected, most temperaments were moderately correlated with one another. Strong positive correlations were observed between the anxious, depressive, and cyclothymic temperaments, in line with the findings on the 110-item Chinese version and other language versions [4,21,24]. Weak but significant negative correlations were found between the hyperthymic and cyclothymic temperaments, and between the hyperthymic and depressive temperaments, as reported in the German [24] and Polish populations [25]. The present study found no correlation between the irritable and hyperthymic temperaments, which was also observed on the 110-item Cantonese version and other language versions such as the Brazilian, Italian and Portuguese-Lisbon [26]. However, both the 110-item and 39-item Chinese versions found a week but significant correlation between the hyperthymic and irritable temperaments. One possible explanation could be the different sampling in different studies, including the 110-item Chinese TEMPS-A (10.7% college students), the 110-item Cantonese TEMPS-A (100% medical students), and the 39-item Chinese TEMPS-A (Medical staff and students) [4,16,17].

We found that the males scored significantly higher than did the females on the hyperthymic and irritable temperaments measured by the present and our previous 110-item version [4]. Similar finding was also observed in the Hong Kong Cantonese culture [17]. As Akiskal suggested, such gender differences could be revolutionarily related to territoriality, aggressiveness [18] and a relatively dominant status for males in the Chinese society. In line with the 110-item Chinese version, the present study found a very low percentage of the dominant hyperthymic temperament, suggesting being "modest" may be in prevalence and considered as a norm in the culture.

There are several limitations that should be noted. Firstly, this study was unable to assess the test–retest reliability of the short TEMPS. Secondly, there were more females than males. Future studies need to assess the gender differences in affective temperaments in a sample of balanced sex ratio. Thirdly, the sensitivity and specificity of the TEMPS-A in terms of differentiating healthy controls from patients with affective disorders could not be established in this study and warrants further investigation. Fourthly, we did not apply both the full version and the present version, future studies need to apply both the full and the short versions to the same participants so as to test whether the short version assesses affective temperaments as sensitively as the full version. Finally, we did not test the convergent validity of the present short version.

Conclusion

We psychometrically validated the present 45-item Chinese TEMPS-A, which shows comparable psychometrical properties to its full-version Chinese (Mandarin) TEMPS-A that we previously validated. We recommend combining all the somatic symptoms items into one "yes/no" item, in doing which the worry items could be separated from the cyclothymic temperament as a distinct factor, assisting in improving the internal consistency of the anxious temperament. Applying the TEMPS-A to different clinical populations is much needed, highlighting the importance of validating the present short version.

List of abbreviations

TEMPS-A**:** Temperament Evaluation of Memphis Pisa Paris and SanDiego–Autoquestionnaire

PCA: Principal component analysis

SD: Standard deviation

Acknowledgements

The authors would like to thank all the participants who contributed to the study.

Funding

The study was funded by the National Natural Science Foundation of China (NSFC, 81471375; 81671347).

Availability of data and materials

The authors confirm that, for approved reasons, some access restrictions apply to the data underlying the findings. Due to ethical restrictions, the data cannot be made publicly available, but it is available upon request. The data set contains identifying participant information, which is not suitable for public deposition. The request should be directed to the corresponding author.

Authors' Contribution

KL and LC drafted the manuscript. KL revised the manuscript. LC analysed the data. KC and HO recruited the participants and collected and input the data. HA gave critical comment to the study. GX and KL conceptualized and designed the study. All authors have approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

Not applicable

Ethics approval and consent to participate

The final study protocol and the final version of the written informed consent form were approved by the Ethics Committee of the Guangzhou Brain hospital (No.2014019). Written informed consent was obtained from each of the participants prior to participation. Information obtained was kept confidential.

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