

The factor structure of the Chinese version of the Temperament and Character Inventory: Factorial robustness and association with age and gender

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Abstract

Objective: To examine the factor structure of the 144-item Chinese version of the Temperament and Character Inventory (TCI) and its association with age and gender in a large non-clinical population.

Method: We recruited 1966 non-clinical participants in China who completed the TCI Chinese version. They were randomly divided into two independent samples. One sample (n=983) was used for exploratory factor analysis (EFA), and the other (n=983) for confirmatory factor analysis (CFA).

Results: An EFA suggested a four-factor structure for temperament domains and a three-factor structure for character domains. This was confirmed by a CFA. Women showed significantly higher scores on harm avoidance, reward dependence, co-operativeness, and self-transcendence than men. Age affected every subscale expect for reward dependence.

Conclusion: The factor structure of the Chinese TCI was similar to the original factor structure, with some differences reflecting the culture of a Chinese population.

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1. Introduction

The Temperament and Character Inventory (TCI) is a widely used instrument for measuring personality. It was designed and developed by Cloninger's group in 1994, and includes temperament and character dimension [1]. Temperament refers to automatic emotional responses to experiences that are moderately heritable or stable throughout life, and consists of four traits, namely novelty seeking (NS), harm avoidance (HA), reward dependence (RD), and persistence (P). Character refers to self-concepts and individual differences in goals or values, and is moderately

influenced by insight and learning and mature in progressive steps. This facet consists of three traits, namely self-directedness (SD), cooperativeness (C), and self-transcendence (ST). The TCI has been translated into many languages and administered in many nations. The original TCI data were collected in the US [1]. Subsequent TCI studies that included normative data were conducted in different countries, e.g., Italy [2,3], Finland [4], Malaysia [5], Japan [6], and Korea [7].

Because the TCI is used in many countries with different cultural and linguistic backgrounds, it is important to ensure the similarity of the factor structure among various TCI versions. This is particularly true because the factor structure of a measurement represents that measurement's theoretical framework and has an influence on scoring, interpretation and further analysis. Some studies have provided evidence that the hypothesized seven factors structure of the TCI is sustained across various versions. For instance, Takeuchi and colleagues [8] used exploratory factor analyses (EFA) and confirmatory factor analyses

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(CFA) to analyze the Japanese version in order to test the robustness of the 7-factor structure. The factor analysis results of the Italian version were also consistent with the 7-factor structure [2].

Gender differences in personality traits are another important issue in psychometrics. Cloninger et al. reported that NS, HA and RD in white males were different from those in white females [1]. In 2006, Cloninger [9] also reported that there were strong gender differences in HA, RD, and C. Using the Finnish version, Miettunen's group reported gender differences in NS, HA, and RD [4]. Takeuchi et al. [8] and Mikołajczyk et al. [10] reported there were gender differences in HA, RD, C, ST (or SD). In the Korean version, gender differences were found in HA, RD, P, C and SD [7].

Distribution of TCI dimensions across life stages has also been studied with a cross-cultural perspective comparing data from different countries. Cloninger and colleagues reported that age was strongly correlated with C and SD, but not ST [1,11]. Mikołajczyk et al. found that all seven dimensions of the Polish version of the TCI tend to vary with age [10].

The Chinese TCI was reported using Malaysian Chinese populations [5]. This study suggested a similarity of the TCI factor structure between the Chinese and original English versions using an EFA. However, no normative data for the TCI in Mainland China have been available to date. Such normative data are necessary to interpret the scores obtained with the TCI in Mainland Chinese people, but are also of interest to address cross-cultural issues about the assessment of personality in various countries.

In the current study, we examined a population in Mainland China in terms of the entire factor structure of the 144-item Chinese version of TCI. The factor structure derived from an EFA of randomly halved group of subjects was reexamined using a CFA of the remaining half of the subjects. The reason for performing both an EFA and a CFA is to find a general factor pattern with EFA and to cross-validate the EFA results via CFA. Because we were not sure whether the factor structure of the TCI administered to participants in Mainland China would be exactly the same as the original structure, we decided to perform an EFA first, rather than conduct a CFA to examine the factor structure of the TCI directly.

2. Method

2.1. Participants

The data of the present study came from two populations. The first was a population of 486 inhabitants in the northeastern area of China and Beijing. This consisted of 239 men and 239 women. Their mean (SD) age was 41.7 (11.9) years old. The second group of participants was a set of undergraduate students from 12 universities in southwestern China. This consisted of 788 men and 684 women (127

participants did not report their gender). Their mean (SD) age was 20.8 (1.36) years old.

2.2. Measurement

The TCI is a self-report test evaluating temperament and character dimensions. We used the 144-item Chinese version of the TCI. Each scale of the TCI (including NS, HA, RD, P, SD, C, and ST) consists of 20 items, and has 3 to 5 subscales. Each item in the original version is rated with a 2-point scale ("yes" or "no"). In this study, items were rated using a 5-point scale (1="very unlikely" to 5="very likely") following Kijima et al. [6], who reported greater internal consistency of the TCI scales. It is of note that the 144 items in the Chinese version contained four validity items. These items were not used in this study. In addition, when we conducted the questionnaire survey in the first participant group, the response rate was extremely low for several items. They were items 12 ("I often ask for supernatural forgiveness for violating the absolute ideals of truth and harmony in all things"), 29 ("I sometimes feel so connected to nature that everything seems to be part of one living organism"), 42 ("Sometimes I have felt like I was part of something with no limits or boundaries in time and space"), 95 ("I am grateful for supernatural guidance"), 110 ("I often feel like I am a part of the spiritual force on which all life depends"), and 130 ("I feel that there is a supernatural source of love and peace that often helps me in the way that is really needed"). The response rates to these items were 22.7%, 22.5%, 23.0%, 36.8%, 22.5%, and 22.5%, respectively. These items were excluded from the subsequent TCI survey in the second participant group. The analyses of this study were therefore based on the data from 134 items (144, minus 4 validator items, minus 6 culturally unsuitable items).

2.3. Statistical analyses

Statistical analyses were performed using SPSS 18.0 and AMOS 18.0. We calculated the mean and SD of each TCI item and its correlation with the total dimension score. Because there were some people ($n=111$) who failed to respond to 120 items or more, we excluded them and used the remaining 1966 participants for the subsequent analyses.

We then randomly divided the whole population into two groups. The first group consisted of 487 men and 433 women (the gender of 63 participants was not reported). Their mean (SD) age was 25.9 (10.7) years old. Men and women did not differ significantly in terms of mean age. The second group consisted of 473 men and 449 women (the gender of 61 participants was not reported). Their mean (SD) age was 26.3 (11.4) years old. Men and women did not differ significantly in terms of mean age. Using data from the first group, we performed separate EFAs of the temperament and character subscales. Missing values of each TCI item were substituted by that item's mean value. Nevertheless, about

88% of the participants (867/983) responded to at least 98% of the items (131/134 items).

In order to investigate the robustness of the factor structure yielded by the EFAs, we then performed separate CFAs of the temperament and character subscales using the second group data. In the second group, missing values of each TCI item were also substituted by the item’s mean value. About 84% of subjects (829/983) responded to at least 99% (132/134 items) of the items. The fit of each model with the data was examined in terms of goodness-of-fit index (GFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA). According to conventional criteria, a good fit would be indicated by $GFI > 0.95$, $CFI > 0.95$, and an acceptable fit by $GFI > 0.90$, $CFI > 0.80$. RMSEA values ≤ 0.05 can be considered as a good fit, values between 0.05 and 0.08 as an adequate fit, and values between 0.08 and 0.10 as mediocre fit [12,13].

The scores of the TCI scales and subscales were compared between men and women. They were also compared between different age groups by a one-way analysis of variance (ANOVA): less than 21 years ($n=599$), 21–25 years ($n=776$), 26–35 years ($n=168$), 36–45 years ($n=119$), and more than 45 years ($n=164$).

3. Result

3.1. Preliminary analyses

The mean and SD of each TCI item was calculated (data not shown but available on request from the first author). The correlation between each TCI item and the total score of the scale to which the item belonged was also calculated. Almost all the correlations were statistically significant but they ranged from 0.08 to 0.52 for NS, -0.19 to 0.48 for HA, -0.01 to 0.47 for RD, 0.10 to 0.53 for P, 0.05 to 0.55 for SD, 0.03 to 0.57 for C, and 0.07 to 0.66 for ST.

3.2. Internal consistency

The Cronbach’s α for the seven TCI scales ranged from 0.488 to 0.766 for the temperament scales (NS, HA, RD, P), and from 0.695 to 0.823 for the character scales (SD, C, ST). The lowest α coefficients were observed for the RD scale (0.488) and the NS scale (0.557). The α coefficients of the other five scales (NS, HA, SD, C, ST) were above 0.695.

The range of α coefficients for the temperament and character subscales is presented in detail (Table 3). Twelve of the 29 subscales showed α coefficients above .40, except NS1, NS2, NS4, HA1, SD2, SD5, C3, C5, and RD1-4 (Table 1).

3.3. Exploratory factor analysis

Using the first split-half group of participants, we performed separate EFAs of the temperament and character

Table 1
Cronbach’s Alpha of Temperament and character subscales.

Temperament		Character	
Subscale	Cronbach’s Alpha	Subscale	Cronbach’s Alpha
NS	0.557		
NS1	0.307	SD	0.720
NS2	0.285	SD1	0.450
NS3	0.403	SD2	0.310
NS4	0.357	SD3	0.610
HA	0.717	SD4	0.662
HA1	0.254	SD5	0.283
HA2	0.462		
HA3	0.479	C	0.695
HA4	0.423	C1	0.593
RD	0.488	C2	0.494
RD1	0.227	C3	0.340
RD2	0.383	C4	0.454
RD3	0.151	C5	0.380
RD4	0.298		
P	0.766	ST	0.823
P1	0.403	ST1	0.701
P2	0.426	ST2	0.546
P3	0.533	ST3	0.489
P4	0.581		

NS1 indicates exploratory-excitability; NS2, impulsiveness; NS3, extravagance; NS4, disorderliness; HA1, anticipatory worry; HA2, fear of uncertainty; HA3, shyness; HA4, fatigability; RD1, sentimentality; RD2, openness to warm communication; RD3, attachment; RD4, dependence; P1, eagerness of effort; P2, work hardened; P3, ambitious; P4, perfectionist; SD1, responsibility; SD2, purposeful; SD3, resourcefulness; SD4, self-acceptance; SD5, enlightened second nature; C1, social acceptance; C2, empathy; C3, helpfulness; C4, compassion; C5, pure-hearted conscience; ST1, self-forgetful; ST2, transpersonal identification; ST3, spiritual acceptance.

dimension subscales. All factors were considered dependent upon each other. Therefore, the factor solution was sought after PROMAX rotation, which is a diagonal rotation.

Table 2
Exploratory factor analysis of the TCI temperament domains in the first group.

TCI subscales	Factors			
	1	2	3	4
P3: Ambitious	0.78	-0.06	-0.01	-0.05
P4: Perfectionist	0.75	0.01	-0.15	0.03
P1: Eagerness of effort	0.69	0.04	0.06	-0.01
P2: Work hardened	0.58	-0.22	-0.08	-0.09
RD1: Sentimentality	0.56	0.45	0.21	0.25
HA2: Fear of uncertainty	0.13	0.79	-0.04	-0.03
HA1: Anticipatory Worry	-0.03	0.69	-0.18	0.17
HA3: Shyness	-0.08	0.69	-0.04	-0.19
HA4: Fatigability	-0.25	0.52	0.20	-0.04
NS4: Disorderliness	0.03	-0.02	0.68	-0.07
NS2: Impulsiveness	-0.17	0.12	0.59	-0.01
NS1: Explorative excitability	0.10	-0.17	0.52	0.11
NS3: Extravagance	-0.31	-0.15	0.47	0.22
RD3: Attachment	-0.05	0.07	0.13	0.71
RD2: Openness to warm communication	0.19	-0.30	0.05	0.62
RD4: Dependence	-0.29	0.09	-0.41	0.50
% of variance explained	21.9%	10.9%	9.0%	8.0%

Factor loadings with 0.45 or more are in bold.

The EFA of the temperament dimension subscales yielded four factors (Table 2). The first factor was loaded highly by all four P subscales and RD1. All four HA subscales and RD1 showed high factor loadings on the second factor. All four NS subscales loaded highly on the third factor. The final factor was loaded highly by RD2, RD3, and RD4.

The EFA of the character dimension subscales yielded three factors (Table 3). All five C subscales, SD1, and SD2 showed high factor loadings on the first factor. The second factor was loaded by all three ST subscales. Finally, SD3, SD4, and SD5 loaded highly on the third factor.

The factor structure of the Chinese TCI yielded by an EFA was thus similar to that of the original English version. There were, however, some exceptions: RD1 showed high loading on factors 1(P) and 2 (HA), and SD1 and SD2 showed high loading on factor 1(C) but not factor 3 (SD).

3.4. Confirmatory factor analysis

We then performed two separate CFAs for the temperament and character dimension subscales using the second group of participants. In this analysis we posited latent variables for the same temperament and character dimensions as the original ones (Fig. 1). In addition, taking into consideration the EFA results on temperament and character dimensions, we set a path from the latent variable Persistence towards RD1, because RD1 was loaded 0.56 on the first factor. We also set a path from the latent variable Harm Avoidance towards RD1 because RD1 was loaded 0.45 on the second factor. A path from Reward Dependence to RD1 was added despite RD1 being loaded 0.25 because of theoretical considerations. Correlations between latent variables were added if indicated by a greater modification index. The final model (Fig. 1) showed that all the paths from the latent variables towards the temperament subscales were significant. The latent variable Novelty Seeking was significantly

correlated with the latent variables Harm Avoidance, Reward Dependence, and Persistence. A significant (negative) correlation was also found between Harm Avoidance and Persistence. GFI (0.907) and RMSEA (0.080–0.091) were acceptable but CFI (0.754) was poor.

The CFA of the character subscales was performed, adding two paths from the latent variable Cooperativeness toward SD1 and SD2 because these two subscales showed high factor loadings on the first factor in the EFA (Fig. 2). We also set paths from the latent variable Self-Directedness to SD1 and SD2 based on theoretical considerations. We set correlations between the three latent variables. The results showed that all of the paths we set were significant, as were the correlations between the latent variables. GFI (0.955) and RMSEA (0.055–0.070) were considered acceptable but CFI (0.898) was moderate.

We were interested in whether the original factor model (paths from each latent variable only toward its subscales) would fit the data from the present subjects. For the temperament dimensions of the original model, chi-squared was 850.42 ($df=100$); for the character dimensions, chi-squared was 362.29 ($df=62$). There were statistically significant differences between our factor models and the original factor models ($p<0.01$), and the AIC in our factor models was less than in the originals. Thus, our models demonstrated a better fit with the Mainland Chinese population.

3.5. Association with gender and age

Using the whole group of participants (combining the first and second split-half subjects), we compared all the TCI dimension and subscale scores between men and women (Tables 4 and 5). Compared to men, women showed significantly higher scores on HA ($t=4.37$, $p<0.001$), RD ($t=3.98$, $p<0.001$), C ($t=7.60$, $p<0.001$), and ST ($t=2.86$, $p<0.05$). There were no gender differences in NS, P, or SD.

The trend of the TCI dimension and subscale scores was examined over the course of age. It was found that age correlated negatively with NS ($F=34.5$, $p<0.0001$), HA ($F=12.2$, $p<0.0001$), C ($F=7.1$, $p<0.0001$), and ST ($F=13.7$, $p<0.0001$), and positively with P ($F=23.5$, $p<0.0001$) and SD ($r=10.8$, $p<0.001$) (Table 5). Across the five age groups, scores of both NS and HA among people aged 25 years or younger were significantly higher than those among people aged 36 years or older. Scores of both NS and HA among those aged 21 to 25 were significantly higher than those among people aged 26 to 35. P among people aged 25 years or younger was significantly lower than that among those aged 26 or older. Also, P among people aged 26 to 35 was significantly lower than that among people aged 46 or older. SD among people aged 35 or younger was significantly lower than that among those aged 46 or older. In addition, SD among those aged 21 to 25 was significantly lower than that among people

Table 3
Exploratory factor analysis of the TCI character domains in the first group.

TCI subscales	Factors		
	1	2	3
C4: Compassion	0.71	−0.16	−0.07
C1: Social Acceptance	0.71	−0.08	−0.04
C5: Integrated conscience	0.65	−0.14	−0.17
C2: Empathy	0.60	0.43	−0.18
C3: Helpfulness	0.51	0.22	−0.03
SD2: Purposefulness	0.47	0.12	0.29
SD1: Responsibility	0.46	−0.16	0.40
ST1: Self-forgetfulness	−0.09	0.76	0.01
ST2: Transpersonal identify	0.03	0.74	−0.14
ST3: Spiritual acceptance	−0.02	0.70	0.25
SD5: Congruent second nature	−0.13	0.11	0.89
SD3: Resourcefulness	0.30	−0.05	0.52
SD4: Self-acceptance	−0.16	0.02	0.51
% of variance explained	23.6%	14.2%	9.9%

Factor loadings with 0.45 or more are in bold.

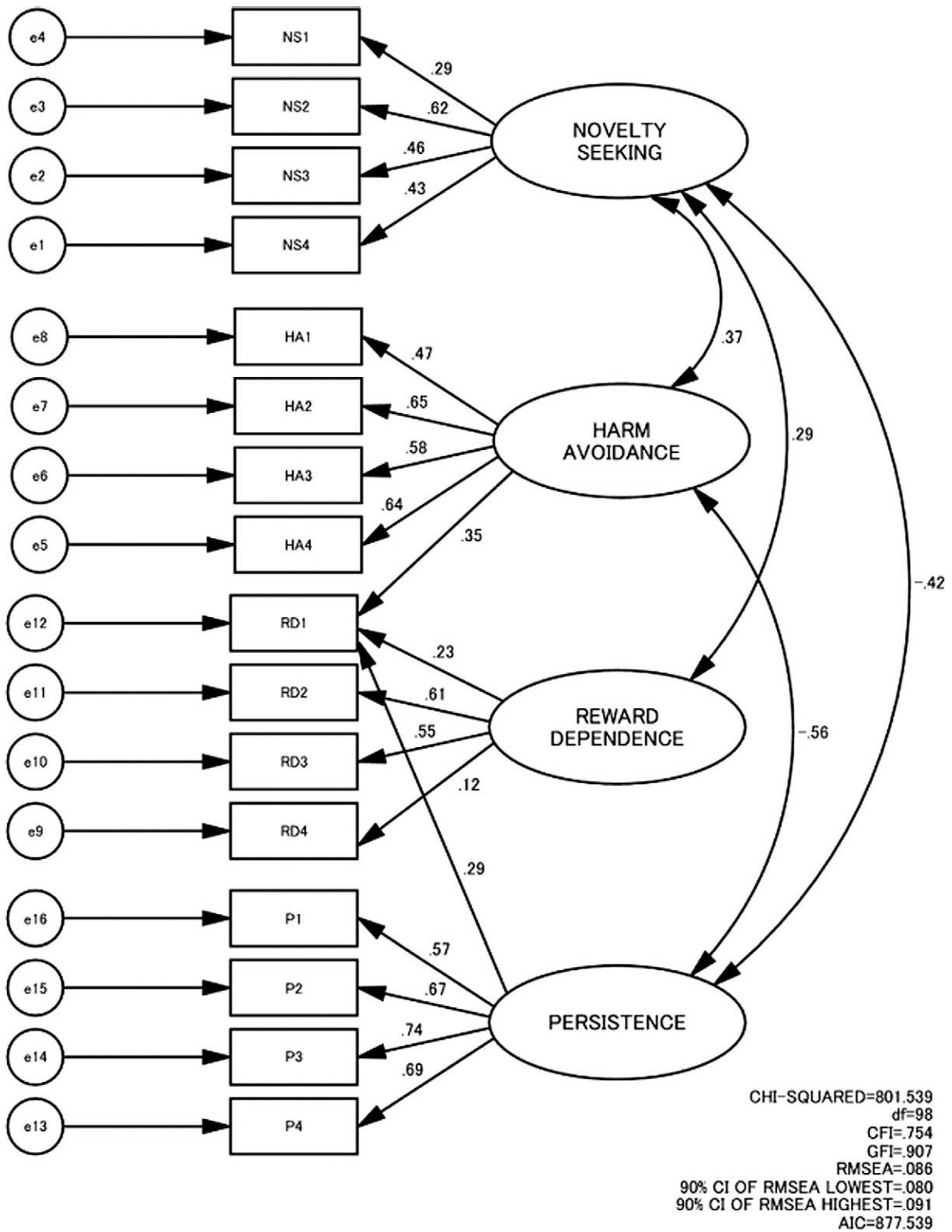


Fig. 1. Confirmatory factor analysis of the TCI temperament domains in the second group.

aged 36 to 45. C among those aged 21 or younger was significantly higher than that among people aged 21 to 45. ST among those aged 25 or younger was significantly

higher than that among people aged 26 to 45. Also, ST among those aged 26 to 35 was significantly lower than that among people aged 46 or older (Table 6).

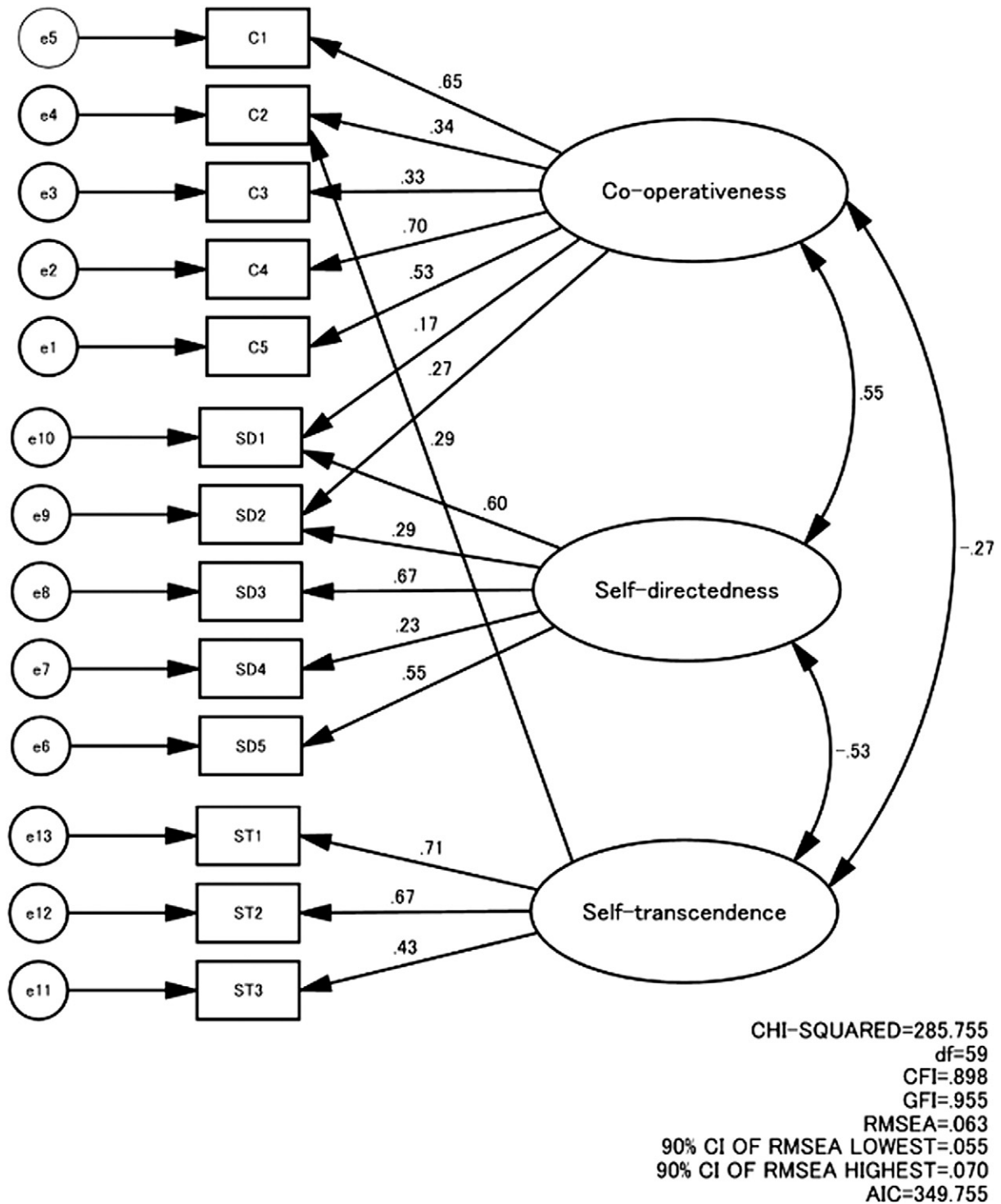


Fig. 2. Confirmatory factor analysis of the TCI character domains in the second group.

4. Discussion

The Temperament and Character Inventory (TCI) is a self-questionnaire used to assess the 7 dimensions of personality defined in the biosocial model of personality. During the past 18 years, TCI has been developed into a series of versions, such as the most commonly used versions—TCI version 9

and TCI-R. In this paper, we selected to study the 144-item TCI, where each dimension has 20 items, while there are also four validity check items. The 144-item TCI differ from the TCI version 9 in several aspects. The true–false item scale was replaced by Likert-type scale (1-definitely false; 5-definitely true). 27 items have been completely rewritten (including 4 validity items) in the 144-item TCI. There was

Table 4
Temperament scores and gender comparison.

Temperament scales and subscales	Number of items	Male Mean scores	Female Mean scores	t
NS	20	57.91	57.07	0.36
HA	20	56.75	58.39	-4.37***
RD	20	59.83	60.94	-3.98***
P	20	56.46	66.01	1.09
NS1: Explore Excitability	5	14.73	14.38	2.91**
NS2: Impulsiveness	5	13.91	14.36	-3.30**
NS3: Extravagance	5	13.65	13.87	-1.40
NS4: Disorderliness	5	14.80	14.41	2.79**
HA1: Anticipatory Worry	5	14.82	15.11	-2.25*
HA2: Fear of uncertainty	5	14.22	15.05	-5.69***
HA3: Shyness	5	13.86	14.27	-2.70**
HA4: Fatigability	5	13.65	13.97	-2.23**
RD1: Sentimentality	5	15.37	15.84	-3.73***
RD2: Openness to warm communication	5	15.59	15.59	0.05
RD3: Attachment	5	14.77	15.11	-2.74**
RD4: Dependence	5	14.11	14.49	-2.70**
P1: Eagerness of effort	5	15.99	15.85	0.99
P2: Perfectionist	5	16.90	16.90	0.03
P3: Ambitious	5	17.16	17.15	0.06
P4: Work hardened	5	16.49	16.19	2.17*

NS, novelty seeking; HA, harm avoidance; RD, reward dependence; P, persistence.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

only 1 short scale measuring P scale and 3 scales measuring RD scale in TCI. While both P scale and RD scale are now composed of 4 facets in 144-item TCI. Generally, 144-item TCI is similar with TCI-R. It contains the same number of subscales as the TCI-R (20 subscales of temperament and 13 subscales of Character). The 144-item TCI are also considered to be an experiment during the revising process of TCI.

Before beginning practical use of the TCI in Chinese populations, we should consider the viability of each TCI item. Low response rates on certain items suggest that these items are unsuitable for culture in Mainland China. For example, items such as “I often ask for supernatural forgiveness for violating the absolute ideals of truth and harmony in all things” and “I sometimes feel so connected to nature that everything seems to be part of one living organism” are viewed as extraordinarily unacceptable. In Mainland China, in spite of freedom of belief, ordinary Chinese people are provided with atheist educations, with the exception of a few ethnic groups. Under the doctrine of Mao, almost all Chinese people believe that individuals can conquer nature, and do not believe in the existence of supernatural power; such beliefs are considered unscientific. This point probably accounts at least in part for the low response rates to related ST items.

These findings are a reminder that when intending to create a personality measure applicable to people with different cultural backgrounds, researchers should pay careful attention to the cultural relevancy of each test item. Items that are appropriate in one cultural background may be

Table 5
Character score and gender comparison.

Character scales and subscales	Number of items	Male Mean scores	Female Mean scores	t
SD	20	61.53	62.30	-1.886
C	20	64.69	67.54	-7.60***
ST	20	59.16	58.12	2.86*
SD1: Responsibility	5	16.20	16.82	-3.74***
SD2: Purposefulness	5	16.60	16.74	-0.930
SD3: Resourcefulness	3	9.41	9.30	1.087
SD4: Self-acceptance	2	5.27	5.44	-1.995*
SD5: Congruent second nature	5	14.13	14.05	0.513
C1: Social acceptance	4	12.81	13.57	-6.06***
C2: Empathy	4	12.86	12.99	-1.12
C3: Helpfulness	4	12.69	12.87	-1.68
C4: Compassion	4	12.80	14.02	-6.44***
C5: Integrated Conscience	4	13.28	14.20	-7.60***
ST1: Self-forgetfulness	9	25.77	25.63	0.247
ST2: Transpersonal Identity	5	14.40	14.16	0.771
ST3: Spiritual Acceptance	6	16.81	16.81	-0.09

SD, self-directedness; C, cooperativeness; ST, self-transcendence.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

viewed as totally incomprehensible in a different cultural background. Hence, future research should identify items that can be understandable across the widest variety of cultural backgrounds possible.

The factor structure of the Chinese TCI was very similar to that of the original English version. However, there were a few areas that were different. In the temperament dimensions, RD1 “Sentimental vs. Insensitive” showed high factor loadings on the factors interpreted as Persistence and Harm Avoidance. High factor loading on Harm Avoidance by RD1 was also reported in Malaysian Chinese [5] and Italians [3]. This is difficult to explain. However, slightly different but emotionally tinted meanings may have been added to items when translated from the original English to Chinese. For example, the item “I like to please other people as much as I can” implies, when translated into Chinese, that one sees himself or herself as subordinate to the people whom he or she likes to please. “To please” in this item implies one giving something to the other for one’s own sake, which carries a negative connotation to Mainland Chinese people. Hence, such implications attached to RD1 may be connected to HA. This means that even items that are correctly translated in one region (such as Malaysia) may convey different nuances to people in different regions (such as Mainland China).

In the character dimensions, SD1 (Responsible vs. Blaming) and SD2 (Purpose vs. Lack of Goal) showed high factor loadings on the factor interpreted as Cooperativeness. This point demonstrated a feature typical of Chinese culture: From childhood, Chinese individuals are asked to subordinate their personal interests to those of a larger group. For Chinese people, the purpose or meaning of

Table 6
Age group comparison of TCI scale scores.

Scale	Mean Score (SD)					F	Tukey
	<21 y ^a	21–25 y ^b	26–35 y ^c	36–45 y ^d	>46 y ^e		
NS	37.8 (6.6)	38.0 (7.0)	36.3 (7.7)	34.0 (7.8)	31.8 (7.8)	34.5***	a, b>d, e; b>c
HA	37.7 (8.4)	38.5 (7.6)	36.2 (9.4)	34.8 (10.3)	34.6 (9.3)	12.2***	a, b>d, e; b>c
RD	40.4 (6.0)	40.2 (6.2)	40.9 (6.8)	40.9 (6.8)	40.2 (6.8)	0.66	
P	45.4 (8.7)	45.1 (8.4)	47.7 (10.1)	49.0 (10.0)	51.7 (10.6)	23.5***	a, b<c, d, e; c<e
SD	41.8 (8.7)	41.0 (9.2)	42.8 (8.7)	43.8 (9.9)	45.6 (9.0)	10.8***	a, b, c,< e; b<d
C	47.3 (8.4)	45.5 (8.7)	44.5 (7.5)	44.3 (9.1)	47.0 (8.6)	7.1***	a>b, c, d
ST	27.9 (6.2)	27.8 (6.3)	24.6 (8.3)	24.7 (7.3)	26.7 (6.9)	13.7***	a, b, >c, d; c<e

NS, novelty seeking; HA, harm avoidance; RD, reward dependence; P, persistence; SD, self-directedness; C, co-operativeness; ST, self-transcendence.

*** $p<0.001$.

life is often related to their family or to other social groups such as those related to their school class, the region in which they live, or their job situation. People who place an explicit emphasis on their own personal goals are considered selfish, indifferent to the interests of the society overall. Similarly, the responsibilities of Chinese people are often associated with family, organization, even country. In this light, the constructs of SD1 and SD2 coincide with the implications of Co-operativeness.

This study showed gender differences in HA, RD, C and ST scores. In this respect it resembled reports that used the English, Japanese, Korean, and Finnish versions of the TCI [1,4–8,14]. In Mainland China, the principle of equal pay for equal work for both men and women has for the most part been in place since 1949. Women are now equal with men in most areas: The state protects the right of women to work on equal terms with men, applies the principle of equal pay for equal work to men and women alike, and provides women with special protection during their menstrual periods, pregnancy, maternity and breastfeeding. Companies also do not differentiate between men and women — they employ and pay both equally. Men and women also equally share their housework; it is quite common for men to cook, clean or take care of children in Mainland China. Sometimes sharing housework is also considered to be an expression of love.

In our study, we were interested in whether there was gender differences in RD. Miettunen et al. [15] pointed out that the sex difference in RD was affected by cultural factors. From Taiwanese data, Chen et al. [16] also reported that women scored lower in RD in a traditional male dominant society because women are facing more pressure. We hypothesized that RD would not show gender differences in a Mainland Chinese population, given the background of social-cultural gender equality in this society. However, our study showed significant gender differences in RD. Thus, we consider that RD may reflect a biological rather than social-cultural trait. This position also conforms to the original theory of temperament dimensions.

In this study, there were significant effects of age on each subscale of TCI except for RD. These findings were similar to those of past studies [4,17–19]. However, the pattern of C

subscales was different from those of the original version: Cloninger's study showed that C increased with age [1], but our study found that C among those aged 21 or younger was significantly higher than that among people aged 21 to 45. One possible reason is that in Western countries, students are less restricted and generally more permitted to do what they please. In China, on the other hand, the management of school is often restrictive. For example, almost all university students in China are asked to live on campus, and times for waking, dining, and sleeping are firmly established. Adolescents live with their peers and follow common rules. This kind of group life probably makes them more cooperative.

There are several limitations in this study. Firstly, the 144-item TCI used in our study isn't a common version. Among the series of TCI, this version can be considered as a semi-finished product, there are only a few validity studies so far on this version. But it does not mean that this study makes no sense. It is very useful for the research using other versions of TCI among Chinese population in the future since a considerable number of items of this version are identical with those of the commonly used TCI version 9 or TCI-R. Especially, some obvious problems have been found through the use of the 144-item TCI. For example, some items of ST dimension involving religion or supernatural power will reduce the enthusiasm of the participants answering questionnaire because most Chinese have no religious belief. The problems appearing in this study make us more interested in cultural comparison.

Secondly, in this paper, we only reported the results from separate factor analyses of temperament and character. It is difficult to make CFA on temperament and character in a single model because the items or subscales of TCI are too many [7]. Therefore, this study makes EFA and CFA on temperament and character separately by reference to the method used in most studies [2,5,7,8]. In fact, we had made a dimensionality analysis on all items before EFA of this study. The result showed that there exist 7 factors indeed (with a condition of eigenvalue greater than 1), but the items of different factors mix together (details of the results are available request). This point indicates that as a semi-finished product, the 144-item TCI has a different factor structure from original TCI. Maybe, these differences are

caused by the cultural differences or item component of the 144-item TCI. It is necessary to study and prove in the future.

The main objective of this study was to examine the factor structure of the Chinese TCI and the effects of gender and age. As far as we know, this is the first report to evaluate Cloninger's temperament and character dimensions in the context of a Mainland Chinese population. Our study that the factor structure of the Chinese TCI was similar to the original factor structure, with some differences reflecting features specific to Chinese culture. Effects of gender and age on the Chinese version also demonstrated a special sociocultural character to Mainland China that was distinct from other areas.

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