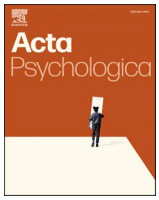
Acta Psychologica 255 (2025) 104931

Contents lists available at ScienceDirect

Acta Psychologica

journal homepage: www.elsevier.com/locate/actpsy



# Psychometric properties of the Chinese version of the Emotion Regulation Skills Questionnaire

Xia Ma [a,b,1], Suyan Wang [c,1], Mengjie Cui [b], Hongliang Dai [b,*], Jianfeng Hu [a,*]

[a] The Affiliated Taizhou People's Hospital of Nanjing Medical University, Taizhou 225300, Jiangsu, China
[b] School of Nursing, Jinzhou Medical University, Jinzhou 121001, Liaoning, China
[c] Center for Mental Health Guidance, Jinzhou Medical University, Jinzhou 121001, Liaoning, China

ARTICLE INFO

*Keywords:*
Emotion regulation
Validity
Reliability
College students
Culture

ABSTRACT

*Background:* The Emotion Regulation Skills Questionnaire (ERSQ) is a valid and reliable tool to measure level of emotion regulation skills. The present study aims to develop a Chinese version of the ERSQ (C-ERSQ), and further establish its psychometric properties among college students.

*Methods:* A total of 848 college students aged 18–35 years answered questionnaires including demographic questionnaire, C-ERSQ, Emotion Regulation Questionnaire (ERQ), Cognitive Emotion Regulation Questionnaire (CERQ), Difficulties in Emotion Regulation Scale (DERS), and Positive and Negative Affect (PANAS). The construct validity was tested using confirmatory factor analysis (CFA), with multi-group CFA administered for analysis of measurement equivalence. Criterion-related validity was performed against ERQ, CERQ, DERS, and PANAS. Internal consistency Cronbach's α, split-half reliability, test-retest reliability, and composite reliability (ω) were used for reliability assessment.

*Results:* Factor analysis support a two-factor structural model of the C-ERSQ, which presented strict invariance across sex, ethnicity, whether having siblings, and student type. Male students, or those without siblings, or those with elevated academic experience showed higher level of emotion regulation. The C-ERSQ validity was also supported by its correlation with existing scales measuring emotion regulation or mental health. This scale also had satisfactory reliability.

*Conclusion:* The two-factor C-ERSQ performs well in assessing emotion regulation skills among Chinese college students.

## 1. Introduction

Emotion regulation can be defined as "extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goals" (Thompson, 2019). Emotion dysregulation has been regarded as one of the critical risk components for the occurrence and maintenance of diverse mental disorders (Cui et al., 2024). For this reason, enhancing emotion regulation skills has been widely considered an efficient therapeutic strategy for trans-diagnostic conditions, and many well-recognized treatments for mental disorders, such as *Emotion Regulation Therapy* for generalized anxiety disorder, emphasize the acquisition of these strategies (Fresco et al., 2013). Thus, understanding the theoretical construct and assessment method would help identify the emotional regulation capacities, and evaluate the effectiveness of an intervention program on the improvement of these capacities.

In 2007, Berking developed the Adaptive Coping with Emotions (ACE) model, and accordingly, the intervention program named Affect Regulation Training (ART) to conceptualize intra-individual emotion regulation process and provide interventions to address the deficits in detail. ACE model and ART were constructed scientifically and systematically over emotional science theories, empirical evidence, professionals' clinical practice experience, and patients' reports regarding emotion regulation deficits. Based on the emotion regulation skills in ACE model and the capability to interpret emotion-related bodily sensation, Berking and Znoj developed a measure (in German) named Selbsteinschätzung emotionaler Kompetenzen-27 (SEK-27) and further Grant, Salsman, and Berking developed its English version named the

* Corresponding authors.
*E-mail addresses:* daihongliang@jzmu.edu.cn (H. Dai), hujianfeng127@163.com (J. Hu).
[1] Xia Ma and Suyan Wang contributed equally to this work.

https://doi.org/10.1016/j.actpsy.2025.104931
Received 3 January 2025; Received in revised form 13 March 2025; Accepted 18 March 2025
Available online 21 March 2025

Emotion Regulation Skill Questionnaire (ERSQ) to comprehensively assess nine aspects of emotion regulation skills, including awareness, clarity, sensation, understanding, compassionate self-report, modification, acceptance, tolerance, and readiness to confront (Berking & Znoj, 2008; Grant et al., 2018). In addition to the German and English versions, several other language versions of ERSQ have also been developed by researchers and practitioners, mainly including the Czech, Japanese, Turkish versions (Fujisato et al., 2017; Klocek et al., 2022; Vatan & Orulular Kahya, 2018). This scale has 27 items to originally evaluate nine domains of emotion-regulation skills, i.e., awareness (AW), clarity (CL), sensation (SENS), understanding (UN), compassionate self-support (SS), modification (MOD), acceptance (AC), tolerance (TO), and readiness to confront (RC) (Grant et al., 2018). Alternatively, the Japanese version of this scale was confirmed to have two factors: "awareness and understanding (AU)" and "acceptance and engagement (AE)", with the former factor containing five skills (SENS, AW, UN, CL, and SS), whereas the latter four skills (TO, RC, MOD, and AC) (Fujisato et al., 2017). ERSQ arguably provides the most detailed assessment on the intra-individual emotion regulation capacities than any other existing scales, such as Emotion Regulation Questionnaire (ERQ) and Difficulties in Emotion Regulation Scale (DERS).

Despite the advantages of ERSQ in assessing emotion regulation skills, two major concerns should be further addressed. First, a large number of college students suffered negative emotion problems due to distress in academic performance, interpersonal interaction, and parent-child relationships, etc., and emotional regulation deficits have been theoretically and empirically confirmed to be critical psychological mechanism underlying these negative affective states (Gong et al., 2022; Yu et al., 2023; Zhang et al., 2022). Thus in order to evaluate emotion regulation issues and analyze underlying mechanism, so as to attain effective intervention and treatment of mental distress among college students, within Chinese culture, it is urgent to develop a Chinese version of ERSQ. Secondly, accumulating evidence has shown that mental health levels and emotional regulation capacities vary among college students with different demographic characteristics, personality trait, or psychiatric conditions (Fujisato et al., 2017; Liao et al., 2022; Zhang & Bian, 2020). For example, a recent study revealed that male college students had higher ERQ expression suppression scores than their female counterparts (Zhang & Bian, 2020). In addition, it was shown that college students inclined to neuroticism might have lower emotion regulation capacities (Liao et al., 2022). Despite these differences, one important concern is whether between-group difference is based on the premise that sample from each group has similar understanding of the items, that is, measurement invariance across various salient demographic variables should be first determined. Measurement invariance test is of significance as non-invariance/non-equivalence due to different understanding of scale items would lead to a meaningless comparison and measurement bias across (groups of) respondents (Jak & Jorgensen, 2017; Romano et al., 2022). One salient instance of this is that there might exist a remarkable gender difference regarding the effect of emotional regulation on psychological health, as revealed in a recent study, which showed that men benefited more from emotion suppression than emotion expression (Mink et al., 2022). Alternatively, individuals living in different cultural context would have different understanding regarding to the same emotion regulation strategies: widely-accepted cognitive appraisal in Western world could be an invalid strategy in Asian countries, while unfavorable expressive suppression in Western counties seems less harmful in Asia (Su et al., 2015). As far as we know, up date, no measurement invariance regarding ERSQ has been tested with respect to grouping variables, such as sex, in healthy respondents, which would limit unbiased comparison between groups and potentially lead to misleading conclusions.

Corresponding to the concerns mentioned above, the present study was designed and conducted to address the following two major issues. First, we attempted to develop a Chinese version of ERSQ, i.e., C-ERSQ on the basis of examination of its psychometric properties, including construct validity, criterion-related validity, convergent and discrimination validity, as well as scale reliability, so as to examine the cross-cultural stability of the ERSQ and hopefully provide a more comprehensive measure regarding emotional regulation capacities of Chinese college students. Second, multi-group confirmatory factor analysis (CFA) was employed to identify the measurement invariance of the C-ERSQ factor structure.

## 2. Methods

### 2.1. Participants and procedures

The participants were included in this cross-sectional survey based on questionnaire star platform by the aid of Wechat. The survey was conducted in three universities, two from Liaoning province, and one from Hunan province. Trained investigators explained the purpose of the study and dos and don'ts when filling out these questionnaires and then assigned the quick response (QR) code. In the end, 1043 questionnaires were submitted and 195 failed to pass quality checks, and thus 848 were considered effective (effective response rate, 81.30 %). The preset removal criteria included too short submission time (<200 s), unanimous options for the questions throughout one or more scales, and/or identical options for forward and reverse items. The participants were aged from 18 to 35, 20.44 ± 2.66 years on average. 663 (78.2 %) participants were females. 152 (17.9 %), 561 (66.2 %) and 135 (15.9 %) participants were junior college students, undergraduates, and post-graduates, respectively. 709 (83.6 %) participants were of Han ethnicity, and 139 (16.4 %) were of ethnic minority. 320 (37.7 %) participants had no siblings.

### 2.2. Measures

#### 2.2.1. Emotion-Regulation Skills Questionnaire (ERSQ)

ERSQ is a reliable and valid instrument measuring how individuals have coped with negative emotion in the past week (Berking & Znoj, 2008; Grant et al., 2018). This scale has 27 items to evaluate nine domains of emotion-regulation skills, i.e., awareness (AW), clarity (CL), sensation (SENS), understanding (UN), compassionate self-support (SS), modification (MOD), acceptance (AC), tolerance (TO), and readiness to confront (RC). Each domain consists of three items, with each item scored on a 5-point Likert system from 0 = not at all to 4 = almost always. Studies have shown that this scale had satisfactory psychometric properties under multiple cultural contexts. After receiving permission for translating this instrument from the original authors, this questionnaire was translated into Chinese following a standard backward and forward translation procedure. First, the original English version of this questionnaire was translated into Chinese by two bilingual Chinese speaking psychologists. These two independent translated versions were then reconciled into one preliminary version following discussion and revision by the two translators as well as the project leader. Second, the reconciled forward version was independently back-translated by a psychologist and an English professor, who were blinded to the original English version of this instrument and unaware of the purpose of this study. After discussion among the back-translators and the project leader, an integrated back-translated (English) version was obtained. The research team conducted a meticulous evaluation and comparison between the original, forward-translated, and back-translated versions, so as to modify potentially problematic items of the forward-translated version. The modified forward-translated version was subjected to a second back-translation. This process was repeatedly conducted to finally produce an agreement on a forward-translated draft. Third, cross-cultural adaptation was conducted using a Delphi method among ten experts, all being psychologists or nursing professors, plus a pilot test conducted in 30 college students to examine the item comprehensibility. After further modification and adjustment, a final Chinese version of ERSQ, i.e., C-ERSQ, was developed, as presented in Supplementary file

1. The questionnaire showed a good level of content validity (S-CVI/Ave: 0.989, I-CVI: 0.975–1.00) as evaluated by four psychologists and three nursing professors.

#### 2.2.2. Criterion-related validity measures

Four emotion regulation related questionnaires that have been psychometrically validated and extensively used in China was used in this survey to determine the criterion-related validity of the C-ERSQ. These questionnaires were Emotion Regulation Questionnaire (ERQ) (Zhong et al., 2022), Cognitive Emotion Regulation Questionnaire (CERQ) (Garnefski et al., 2001), Difficulties in Emotion Regulation Scale (DERS) (Gratz & Roemer, 2004), and Positive and Negative Affect (PANAS) (Watson et al., 1988). ERQ addressed the usage of two major emotion regulation strategies, reappraisal and suppression, which are closely related to modification of one's emotion during distress. Higher ERQ scores in these two strategies represent more frequent use of them. Both these two strategies facilitated the emotion regulation towards a desired direction and thus were expected to positively associate with C-ERSQ. CERQ measures two opposite cognitive emotion regulation strategies, i.e., adaptive strategies and non-adaptive strategies, which were rationally assumed to be positively and negatively associated with C-ERSQ scores, respectively. DERS assesses difficulties in multiple emotional regulation dimensions, including awareness, comprehension, acceptance, and adaptive dealing with negative emotions. Higher DERS scores indicated difficulties in emotion regulation and thus DERS was supposed to negatively correlate with C-ERSQ. PANAS contained 20 items in total, with 10 used for rating positive affect and another 10 for negative affect. Considering that emotion regulation skills are helpful in constructing and maintaining mental health, it was expected that the positive affect domain and negative affect domain was positively and negatively correlated with C-ERSQ. In the present study, the Cronbach's α coefficients of these criterion-related scales ranged from 0.842 to 0.970.

### 2.3. Statistical analyses

All the statistical analysis was conducted using IBM SPSS statistics 22.0, AMOS 23.0, R 4.2.1 and Mplus 7. The whole sample ($n = 848$) was were subjected to confirmatory factor analysis (CFA) to analyze the model fit based on previously assumed factor structure (nine-factor or two-factor model). The meaningful factor loading was set at 0.35. The latent Factor structure of the C-ERSQ was determined based on the goodness of fit indexes. The recommended criteria are as follows: the root mean square error of approximation (RMSEA) should <0.080; the standardized root-mean residual (SRMR) should <0.080, and the comparative fit index (CFI) should >0.950 (Rossi et al., 2024). Additionally, measurement invariance was also conducted across sex, ethnicity, whether having siblings, and student type. Measurement invariance was conducted from the least to the stringently restricted solutions. Specifically, configural invariance, metric invariance, scalar invariance, and strict invariance were sequentially performed. Configural invariance was constructed as a baseline, and metric invariance constrained factor loadings to be equal between groups. Further, scalar invariance further constrained intercepts to be equal on the basis of metric invariance. The restrict invariance further constricted residues to be equal following scalar invariance analysis. A ΔCFI <0.010 plus a ΔRMSEA <0.015 suggested a non-rejectable invariance hypothesis (Rigdon, 1996). The reliability of C-ERSQ was determined using internal consistency Cronbach's α, split-half reliability, test-retest reliability (two-week interval among 49 college students), and composite reliability ω value, all of which should exceed 0.7.

## 3. Results

### 3.1. Item analysis

First of all, we examined whether each item in C-ERSQ was integral to the whole scale using item analysis. The scale total score was first lined up in descending order, with the scores of top 27 % assigned to the high-score group, and those of bottom 27 % to the low-score group. As shown in Table 1, each item in the high-score (i.e., the top 27 %) and low-score group (i.e., the bottom 27 %) had significant difference (all $P < 0.01$). Each item also exhibited satisfactory item-total correlation, with correlation coefficients ranging between 0.542 and 0.845 (Table 2). In addition, deleting any item would incur a significant decrease of the scale reliability (Table 3). According to these results, all the 27 items in this scale were considered qualified and thus included for the subsequent evaluation.

### 3.2. Factorial validity

CFA was performed using data obtained from the whole sample ($n = 848$) to confirm the nine-factor structure as raised by the original authors and the two-factor model as found in a Japanese sample, within the Chinese background. To the end, our data did not support the nine-factor structure according to the good-of-fit indexes: $\chi^2 = 2662.309$, df = 288, $P < 0.001$, CFI = 0.876, RMSEA = 0.099, SRMR =0.046.

As for the two-factor structure based on subscale item parcels, after proper model modification according to the top values of modification indexes, the calculated good-of-fit indexes were as follows: $\chi^2 = 126.098$, df = 24, $P < 0.001$, CFI = 0.988, RMSEA = 0.071, SRMR =0.014, exhibiting good fit. Therefore, a two-factor model applies to C-ERSQ. In this model, AU had factor loadings ranging 0.833–0.915, and AE, 0.853–0.902 (Fig. 1). Next the measurement invariance was tested across sex, student type, ethnicity, and whether having siblings via comparison of four models: configural model, the metric invariance model, the scalar invariance model, and the strict invariance model. As shown in Table 4, the configural model had a satisfactory fit across sex ($\chi^2$/df = 3.696, CFI = 0.985, RMSEA = 0.056, SRMR = 0.018), ethnicity ($\chi^2$/df = 3.351, CFI = 0.987, RMSEA = 0.053, SRMR = 0.013), whether

**Table 1**
Comparison in each item of the C-ERSQ between high-score and low-score groups ($n = 848$).

| Item | Low-score group ($n$ = 275) | | High-score group ($n$ = 293) | | CR | $P$ value |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | |
| Q1 | 3.302 | 0.867 | 4.526 | 0.679 | 17.806 | <0.001 |
| Q2 | 3.017 | 0.878 | 4.534 | 0.673 | 21.959 | <0.001 |
| Q3 | 3.186 | 0.821 | 4.632 | 0.535 | 23.702 | <0.001 |
| Q4 | 2.562 | 0.915 | 4.380 | 0.774 | 24.251 | <0.001 |
| Q5 | 2.731 | 0.739 | 4.511 | 0.651 | 28.682 | <0.001 |
| Q6 | 2.897 | 0.758 | 4.553 | 0.588 | 27.315 | <0.001 |
| Q7 | 2.955 | 0.758 | 4.605 | 0.541 | 28.003 | <0.001 |
| Q8 | 2.599 | 0.820 | 4.098 | 0.926 | 19.336 | <0.001 |
| Q9 | 2.831 | 0.835 | 4.455 | 0.722 | 23.351 | <0.001 |
| Q10 | 2.686 | 0.784 | 4.387 | 0.719 | 25.403 | <0.001 |
| Q11 | 2.773 | 0.806 | 4.598 | 0.556 | 29.926 | <0.001 |
| Q12 | 2.405 | 0.875 | 3.850 | 1.197 | 15.399 | <0.001 |
| Q13 | 3.145 | 0.825 | 4.665 | 0.481 | 25.663 | <0.001 |
| Q14 | 2.967 | 0.767 | 4.579 | 0.572 | 26.638 | <0.001 |
| Q15 | 2.880 | 0.803 | 4.504 | 0.691 | 24.308 | <0.001 |
| Q16 | 2.847 | 0.777 | 4.459 | 0.727 | 24.080 | <0.001 |
| Q17 | 2.748 | 0.745 | 4.372 | 0.847 | 22.857 | <0.001 |
| Q18 | 2.694 | 0.755 | 4.421 | 0.744 | 25.920 | <0.001 |
| Q19 | 2.785 | 0.753 | 4.575 | 0.566 | 30.036 | <0.001 |
| Q20 | 2.860 | 0.760 | 4.545 | 0.583 | 27.850 | <0.001 |
| Q21 | 2.781 | 0.710 | 4.583 | 0.552 | 31.722 | <0.001 |
| Q22 | 2.661 | 0.735 | 4.481 | 0.657 | 29.311 | <0.001 |
| Q23 | 2.942 | 0.743 | 4.560 | 0.568 | 27.360 | <0.001 |
| Q24 | 2.855 | 0.711 | 4.511 | 0.603 | 28.154 | <0.001 |
| Q25 | 3.037 | 0.731 | 4.605 | 0.520 | 27.629 | <0.001 |
| Q26 | 2.707 | 0.741 | 4.504 | 0.591 | 30.043 | <0.001 |
| Q27 | 2.731 | 0.755 | 4.553 | 0.582 | 30.588 | <0.001 |

C-ERSQ: the Chinese version of Emotion Regulation Skills Questionnaire; SD: standard deviation; CR: critical ratio.

**Table 2**
Item-total score correlation of the C-ERSQ ($n = 848$).

| Item | *r* | *P* |
|---|---|---|
| Q1 | 0.600 | <0.001 |
| Q2 | 0.688 | <0.001 |
| Q3 | 0.720 | <0.001 |
| Q4 | 0.723 | <0.001 |
| Q5 | 0.758 | <0.001 |
| Q6 | 0.787 | <0.001 |
| Q7 | 0.798 | <0.001 |
| Q8 | 0.631 | <0.001 |
| Q9 | 0.701 | <0.001 |
| Q10 | 0.751 | <0.001 |
| Q11 | 0.800 | <0.001 |
| Q12 | 0.542 | <0.001 |
| Q13 | 0.791 | <0.001 |
| Q14 | 0.789 | <0.001 |
| Q15 | 0.763 | <0.001 |
| Q16 | 0.748 | <0.001 |
| Q17 | 0.732 | <0.001 |
| Q18 | 0.740 | <0.001 |
| Q19 | 0.830 | <0.001 |
| Q20 | 0.787 | <0.001 |
| Q21 | 0.845 | <0.001 |
| Q22 | 0.796 | <0.001 |
| Q23 | 0.813 | <0.001 |
| Q24 | 0.807 | <0.001 |
| Q25 | 0.811 | <0.001 |
| Q26 | 0.791 | <0.001 |
| Q27 | 0.815 | <0.001 |

C-ERSQ: the Chinese version of Emotion Regulation Skills Questionnaire.

**Table 3**
Cronbach's α coefficient of the C-ERSQ following deletion of specific item ($n = 848$).

| Item | Cronbach's α coefficient following deletion of the item |
|---|---|
| Q1 | 0.970 |
| Q2 | 0.969 |
| Q3 | 0.969 |
| Q4 | 0.969 |
| Q5 | 0.969 |
| Q6 | 0.968 |
| Q7 | 0.968 |
| Q8 | 0.970 |
| Q9 | 0.969 |
| Q10 | 0.969 |
| Q11 | 0.968 |
| Q12 | 0.971 |
| Q13 | 0.968 |
| Q14 | 0.968 |
| Q15 | 0.969 |
| Q16 | 0.969 |
| Q17 | 0.969 |
| Q18 | 0.969 |
| Q19 | 0.968 |
| Q20 | 0.968 |
| Q21 | 0.968 |
| Q22 | 0.968 |
| Q23 | 0.968 |
| Q24 | 0.968 |
| Q25 | 0.968 |
| Q26 | 0.968 |
| Q27 | 0.968 |

C-ERSQ: the Chinese version of Emotion Regulation Skills Questionnaire.

having siblings ($\chi^2/df = 3.376$, CFI = 0.987, RMSEA = 0.053, SRMR = 0.018), or student type ($\chi^2/df = 3.240$, CFI = 0.980, RMSEA = 0.051, SRMR = 0.023). These results suggested that there was no difference in factor structure as regard to these variables. A measurement invariance can be acknowledged when ΔCFI < −0.010, and ΔRMSEA <0.015 (Chen & Fang, 2007). Thus, the C-ERSQ also exhibited measurement invariance at strict levels across all these variables. Therefore, the C-ERSQ can be used for evaluation and unbiased comparison of level of emotional regulation skills across these demographic variables. On the basis of its perfect performance in measurement equivalence, we further analyzed between-group difference of C-ERSQ scores as regard to the four demographic variables. As shown in Table 5, students being males, having no siblings, and having higher educational background also presented higher ERSQ scores at both total scale and subscale levels.

### 3.3. Convergent validity and discrimination validity

As shown in Table 6, the average variance extracted (AVE) values for C-ERSQ AU and AE were 0.794 and 0.777, respectively. This, together with the standardized factor loadings, suggested a strong convergent validity of this scale. In addition, the square root of each factor was higher than the inter-factor correlation (0.891/0.881 vs 0.264), which indicated a satisfactory discriminant validity.

### 3.4. Criterion-related validity

The score of C-ERSQ was positively correlated with the ERQ-CR, ERQ-EI, CERQ-AS, CERQ-NAS, and PANAS-PA scores, and negatively with DERS and PANAS-NA scores. Furthermore, these correlations were practically consistently seen in both sexes (Table 7). These results suggest a good criterion-related validity.

### 3.5. Reliability analysis

The internal consistency of Cronbach's α coefficients of the overall C-ERSQ and its two domains were 0.970, 0.933 (AE), and 0.945 (AU), respectively. The split-half reliability of the overall C-ERSQ and its two domains were 0.972, 0.934 (AE), and 0.952 (AU), respectively. The test-retest reliability across two weeks of the overall C-ERSQ and its two domains were 0.792, 0.769 (AE), and 0.780 (AU), respectively. The composite reliability (ω) of the overall C-ERSQ and its two domains were 0.971, 0.934 (AE), and 0.946 (AU), respectively. These results indicated that the C-ERSQ had excellent reliability.

## 4. Discussion

ERSQ is a valid and reliable instrument for measuring intra-individual emotional regulation capacities. The current study was conducted to develop a Chinese version of this scale, i.e., C-ERSQ, among Chinese college students and further examine its psychometrics. Studies have shown that this scale exhibited a nine-factor structure in a German sample (Berking & Znoj, 2008), or a two-factor structure in a Japanese sample (Fujisato et al., 2017). In the current study, we provided evidence verifying that the two-factor structure applicable to Japanese population also was also more practicable among Chinese college students, as evidenced by the satisfactory fitting indexes, standardized factor loadings, and concurrent validity as well as excellent scale reliability. Additionally, we also confirmed that the C-ERSQ presented strict measurement invariance across a range of salient demographic variables, such as sex, ethnicity, whether having siblings, and student type, thereby comparison of emotion regulation level based on C-ERSQ across these demographic characteristic would be meaningful.

This study took efforts to seek out the optimal factorial structure of the C-ERSQ. We first re-analyzed the model fittings of both the nine-factor and two-factor structures and found that after reasonable comparison and exclusion, we finally decided that two-factor structure, which was previously shown applicable in Japanese (Fujisato et al., 2017), seemed also applicable to constructing emotional regulation skills among Chinese college students. The reason might be ascribed to the following two aspects. First, the original ERSQ might in reality hold a two-factor structure. Although the original developers proposed the nine-factor model theoretically, this structure was not adequately supported in the EFA analysis afterward (Berking et al., 2012; Berking & Znoj, 2008). Secondly, both Japanese and Chinese are of Asian

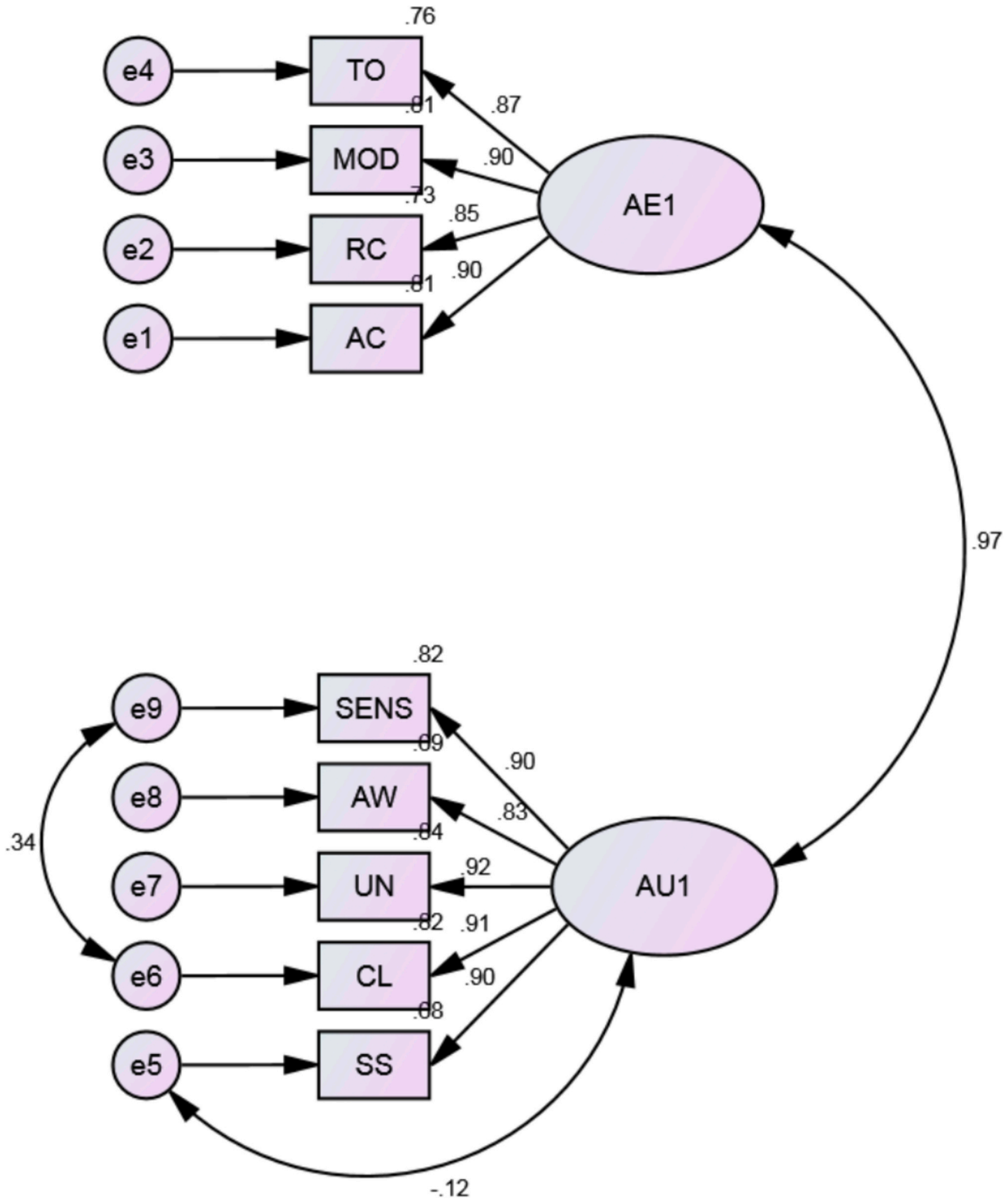



**Fig. 1.** Measurement model of the C-ERSQ. TO: tolerance; SS: self-support; RC: readiness to confront; AC: acceptance; SENS: sensation; AW: awareness; UN: understanding; CL: clarification; MOD: modification.

backgrounds and thus share much similarity in national psychology. Specifically, collectivism cultural pattern in Eastern Asian societies, such as Japan and China, emphasizes more focus on others' feeling, rather than that of their own, resulting in incapability to minutely distinct these intra-individual emotion regulation strategies (Berking & Znoj, 2008; Butler et al., 2007).

Measurement invariance tests psychometric equivalence of a construct across varied demographic characteristics or measurement occasions, and is the prerequisite for between-group comparisons. Multigroup CFA is widely used for evaluation of measurement invariance through conventional four-step procedures to test configural, metric, scalar, and strict invariances in progression. These four invariances

**Table 4**
Measurement invariance of the C-ERSQ across sex, ethnicity, whether having siblings, and student type ($n = 848$).

| | Model | $\chi^2$ | df | Δχ2 | Δdf | *P* | CFI | ΔCFI | RMSEA | ΔRMSEA |
|---|---|---|---|---|---|---|---|---|---|---|
| Sex | Configural | 177.405 | 48 | | | | 0.985 | | 0.056 | |
| | Metric | 189.399 | 55 | 11.994 | 7 | 0.101 | 0.985 | 0 | 0.054 | −0.002 |
| | Scalar | 191.152 | 58 | 1.753 | 3 | 0.625 | 0.985 | 0 | 0.052 | −0.002 |
| | Strict | 245.629 | 67 | 54.477 | 9 | <0.001 | 0.979 | −0.006 | 0.056 | 0.004 |
| Ethnicity | Configural | 160.849 | 48 | | | | 0.987 | | 0.053 | |
| | Metric | 168.709 | 55 | 7.860 | 7 | 0.345 | 0.987 | 0 | 0.049 | −0.004 |
| | Scalar | 178.454 | 58 | 9.745 | 3 | 0.021 | 0.986 | −0.001 | 0.050 | 0.001 |
| | Strict | 196.721 | 67 | 18.267 | 9 | 0.032 | 0.985 | −0.001 | 0.048 | −0.002 |
| Whether having siblings | Configural | 162.040 | 48 | | | | 0.987 | | 0.053 | |
| | Metric | 169.503 | 55 | 7.463 | 7 | 0.382 | 0.987 | 0 | 0.050 | −0.003 |
| | Scalar | 179.067 | 58 | 9.564 | 3 | 0.023 | 0.986 | −0.001 | 0.050 | 0 |
| | Strict | 202.043 | 67 | 22.976 | 9 | 0.006 | 0.984 | −0.002 | 0.049 | −0.001 |
| Student type | Configural | 233.309 | 72 | | | | 0.980 | | 0.051 | |
| | Metric | 241.557 | 79 | 8.248 | 7 | 0.311 | 0.980 | 0 | 0.049 | −0.002 |
| | Scalar | 246.786 | 82 | 5.229 | 3 | 0.156 | 0.980 | 0 | 0.049 | 0 |
| | Strict | 294.650 | 91 | 47.864 | 9 | <0.001 | 0.975 | −0.005 | 0.051 | 0.002 |

**Table 5**
Comparison of C-ERSQ scores across groups ($n = 848$).

| Variable name | Grouping | | | t/F | P |
|---|---|---|---|---|---|
| Sex | Male | Female | | | |
| ERSQ | 104.114 ± 19.155 | 98.377 ± 19.296 | | 3.581 | <0.001 |
| AU | 58.681 ± 10.555 | 55.544 ± 10.649 | | 3.549 | <0.001 |
| AE | 45.432 ± 9.012 | 42.833 ± 9.026 | | 3.465 | 0.001 |
| Ethnicity | Han | Ethnic minority | | | |
| ERSQ | 99.907 ± 19.833 | 98.209 ± 17.013 | | 0.944 | 0.346 |
| AU | 56.354 ± 10.961 | 55.590 ± 9.272 | | 0.770 | 0.442 |
| AE | 43.553 ± 9.224 | 42.619 ± 8.304 | | 1.109 | 0.268 |
| Whether having siblings | No | Yes | | | |
| ERSQ | 102.456 ± 17.765 | 97.915 ± 20.151 | | 3.324 | 0.001 |
| AU | 57.900 ± 9.767 | 55.216 ± 11.116 | | 3.565 | <0.001 |
| AE | 44.556 ± 8.443 | 42.699 ± 9.386 | | 2.900 | 0.004 |
| Student type | Junior college students | Undergraduates | Postgraduates | | |
| ERSQ | 85.711 ± 19.392 | 103.048 ± 18.166 | 101.089 ± 17.470 | 54.282 | <0.001 |
| AU | 48.388 ± 10.842 | 58.080 ± 9.984 | 57.363 ± 9.453 | 56.503 | <0.001 |
| AE | 37.322 ± 8.982 | 44.968 ± 8.569 | 43.726 ± 8.440 | 47.112 | <0.001 |

C-ERSQ: the Chinese version of Emotion Regulation Skills Questionnaire; AU: awareness and understanding; AE: acceptance and engagement.

**Table 6**
Convergent and discriminant validity of the C-ERSQ ($n = 848$).

| | AU | AE |
|---|---|---|
| AU | **0.794** | |
| AE | 0.264** | **0.777** |
| $\sqrt{AVE}$ | 0.891 | 0.881 |

C-ERSQ: the Chinese version of Emotion Regulation Skills Questionnaire. Figures in bold represent AVE.
** $P < 0.01$.

represent equivalence in model form, factor loadings, item intercepts, and item residuals, respectively. The current study examined measurement invariance among a host of demographic variables and compared the between-group difference based on these variables. The data suggested that measurement equivalence was consistently held at all the four invariance levels across sex, ethnicity, whether having siblings, and student type, suggesting that a unbiased comparison of C-ERSQ can be achieved among college students, at least from the perspective of these four grouping variables. In addition, we also found that male and those without siblings or higher academic qualification (undergraduates and postgraduates) had higher C-ERSQ score. Although the statistical significance in the scale score does not necessarily mean the difference of level of emotional regulation skills, especially between genders and whether having siblings in view of the comparatively small difference in between-group means, it at least reflect the tendency of difference of the level of emotional regulation skills alongside these demographic characteristics. Previously findings showed that males had significantly higher emotion regulation level than females (Zhang & Bian, 2020), and the fact that women is the twice occurrence of anxiety and depression of the men (Kessler et al., 2005). Compared with men, women have been shown to use maladaptive cognitive emotion strategies, such as *Rumination* and *Catastrophizing* (Garnefski et al., 2004). Furthermore, a recent event-related potential (ERP) study has revealed that females are more sensitive to emotionally negative stimuli, reflected both in early emotional reactivity and in later emotional regulation process (Gardener et al., 2013). As for ERSQ difference between those with and without siblings, a potential explanation of this is that in Chinese culture those without siblings are more likely to approve independent self-construal and use cognitive reappraisal strategies, which mainly target internal experience of emotion and conceptually cover most constructs in ERSQ. This assumption was corroborated by the stronger correlation of ERSQ with reappraisal than expressive suppression and also the more use of cognitive reappraisal strategies (data for the later were not shown) by college students without siblings. The ERSQ difference between postgraduates/undergraduates and junior college students might be accounted by their age difference. In the present study, the ages of junior college students, undergraduates and postgraduates were 18.38 ± 0.659, 19.90 ± 1.682, and 24.99 ± 2.371, respectively. According to previous reports, cognitive coping strategies were increasingly used and became more matured with increase of individual ages (Garnefski et al., 2002).

Regarding to correlation between C-ERSQ and existing multiple emotional regulation and mental health scales, as expected, our data showed that this scale was strongly and positively correlated with ERQ-CR. This is easy to understand, as reappraisal strategies engage in intangible internal emotion process and exhibit cross-cultural significance in combating adversity (Ford & Mauss, 2015). In addition, a weak

**Table 7**
Criterion-related validity of the C-ERSQ with respect to ERQ, CERQ, DERS, and PANAS.

| ERSQ | ERQ-CR | ERQ-EI | CERQ-AS | CERQ-NAS | DERS | PANAS-PA | PANAS-NA |
|---|---|---|---|---|---|---|---|
| All subjects ($n = 848$) | 0.672** | 0.304** | 0.498** | 0.156** | −0.242** | 0.574** | −0.154** |
| Male ($n = 185$) | 0.692** | 0.406** | 0.621** | 0.260** | −0.214** | 0.620** | −0.158* |
| Female ($n = 663$) | 0.661** | 0.258** | 0.455** | 0.106** | −0.272** | 0.551** | −0.175** |

C-ERSQ: the Chinese version of Emotion Regulation Skills Questionnaire; ERQ: Emotion Regulation Questionnaire (CR: cognitive reappraisal; EI: expressive suppression), CERQ: Cognitive Emotion Regulation Questionnaire (AS: adaptive strategies; NAS: non-adaptive strategies); DERS: Difficulties in Emotion Regulation Scale. PANAS: Positive and Negative Affective Schedule (PA: positive affect; NA: negative affect).
* $P < 0.05$.
** $P < 0.01$.

positive correlation was also revealed between ERQ-EI and C-ERSQ. As expected, C-ERSQ had moderate positive correlation with CERQ-AS and weak negative correlation with DERS. Somewhat unexpectedly, our data supported a weak positive correlation between C-ERSQ and CERQ-NAS in males, suggesting that the commonly-recognized "negative" strategies, to a certain extent, might be meaningful in emotional regulation, especially in Asian males, which warrants further attention. The functional significance of emotion regulating capacities as measured by the C-ERSQ was embodied in its medium-to-strong correlation with PANAS-PA.

Three major limitations need to be pointed out in the current study. First, although this scale presented a satisfactory two-factor structure in CFA, this solution was not adequately supported by EFA, suggesting the potential existence of other better factorial structures in Chinese context. Second, convenience sampling strategies used in this study limited the generalization of the conclusions. Third, ERSQ only assesses intra-individual regulation skills, rather than external regulation, such as expressive suppression. Thus this instrument seems insufficient for evaluation of all emotion regulation capacities in real practice.

## 5. Conclusion

This study developed the Chinese version of the ERSQ (C-ERSQ) and confirmed its psychometrics among college students. In addition, we also conducted measurement invariance regarding the C-ERSQ and confirmed its measurement equivalence across a host of important demographic variables, i.e., sex, ethnicity, whether having siblings, and student type. Altogether, this C-ERSQ is expected to be a promising tool for evaluation of emotion regulation level of college students with varied characteristics.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.actpsy.2025.104931.

## CRediT authorship contribution statement

**Xia Ma:** Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Suyan Wang:** Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Mengjie Cui:** Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Hongliang Dai:** Writing – review & editing, Writing – original draft, Validation, Supervision, Resources, Project administration, Formal analysis, Conceptualization. **Jianfeng Hu:** Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Formal analysis, Conceptualization.

## Ethics approval and consent to participate

The study protocol adhered to the Declaration of Helsinki and was approved by the Ethical Committee of the Jinzhou Medical University (JZMULL2022111). All the participants gave their informed consent to participate in this survey.

## Relevance for clinical practice

ERSQ arguably provides the most detailed assessment on the intra-individual emotion regulation capacities than any other existing scales. In addition, higher ERSQ score well predicts resultant reduction of severity of anxiety and depression symptoms in non-clinical and clinical cohorts. Thus the adapted Chinese version of this scale (i.e., C-ERSQ) is expected to help mental health practitioners and researchers effectively, precisely and economically evaluate a broad range of emotional regulation abilities of Chinese college students when addressing their mental problems.

## Funding

None.

## Declaration of competing interest

The authors declare that they have no conflict of interest.

## Acknowledgement

None.

## Data availability

The datasets used during the current study will be made available from the corresponding author on reasonable request.

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