



# Validation of the Chinese version of joint protection self-efficacy scale in patients with rheumatoid arthritis

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## Abstract

**Objective** To develop and validate the Chinese version of the Joint Protection Self-Efficacy Scale (CJP-SES) in patients with rheumatoid arthritis (RA) in China.

**Method** (1) Translation of the original German/English version JP-SES and cultural adaptation into the Chinese language; (2) Validation of the CJP-SES with the Chinese versions of the Arthritis Self-Efficacy Scale-8 (ASES-8), the Laffrey Health Conception Scale (LHCS), 10-item Perceived Efficacy in Patient-Physician Interactions Scale (PEPPI-10), Disease Activity Score-28 (DAS-28) and Health Assessment Questionnaire (HAQ). Instrument measurement included reliability testing, item generation, construct validity, test–retest reliability, and correlation with other measurements. Confirmatory factor analysis was applied to determine construct validity and internal consistency. One hundred fifteen patients with RA were investigated.

**Result** Finally, 105 RA patients were included in the analysis. Confirmatory factor analysis demonstrated fit for a unidimensional model of the JP-SES. Additionally, the scale showed internal consistency (Cronbach's  $\alpha$  coefficient 0.922), kappa coefficient (0.653), and test–retest reliability (ICC = 0.94). Weak correlations with other scores for the other instruments, such as the Chinese version of ASES-8 (0.263) and PEPPI-10 (0.326). Correlation with duration (0.274), moderate correlation with BMI (−0.438) and DAS-28 (−0.493), and strong correlation with HAQ (−0.644) were found in this research.

**Conclusion** This is the first study to adapt and validate the JP-SES into Chinese for use in patients with RA. Our research showing that the CJP-SES has a good construct validity, internal consistency, and test–retest reliability. This scale can help doctors and nurses to assess the self-efficacy of patients with RA.

**Trial registration** ClinicalTrials.gov Identifier: TJYY-YLS-036

**Keywords** Joint protection · Rheumatoid arthritis · Self-efficacy · Validation

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Li X Zhang is the co-first author in the article.

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## Abbreviations

RA	Rheumatoid arthritis
C-JP-SES	Chinese Joint Protection Self-Efficacy Scale
ASES-8	Arthritis Self-Efficacy Scale-8
LHCS	Laffrey Health Conception Scale
PEPPI	Perceived Efficacy in Patient-Physician Interactions Scale
DAS-28	Disease Activity Score-28
HAQ	Health Assessment Questionnaire

## Background

Rheumatoid arthritis (RA) is a chronic disease, characterized by joint synovial inflammation as the main pathological feature. It is also a chronic immunological disease exhibiting changes in symmetrical and invasive systemic multiple arthritis as clinical manifestations [1]. Due to severe courses of the

disease, the RA patients can show ankylosis, severe functional damage, and limited joint mobility, which may influence the patients' quality of life negatively. Asia Pacific League of Associations for Rheumatology published the latest epidemiological data of RA in Asia: The prevalence in China was 0.15–1.14%, which was relatively high in Asia [2].

Following the International Classification of Functioning (ICF) [3], the quality of life of patients with rheumatoid arthritis is influenced by five factors: body function, activities, participation, environmental factors, and personal factors. Despite important developments in the medical treatment of rheumatoid arthritis, this disease has a major impact on the major life areas of many patients. Over the past two decades, the self-management strategies have been emphasized to help RA patients cope with the consequences of the disease [4, 5].

Self-efficacy is a person's confidence to perform a special task or exhibit a specific behavior, which is one of the most powerful elements in terms of personal behavior [6]. Self-efficacy is a core concept of Bandura's social learning theory that attempted to predict and explain the human behavior by referring to the assessment of an individual's competence towards a specific behavior successfully [6]. Thus, self-efficacy related to health issues indicates that a person take appropriate and meaningful action for health outcomes. It is nowadays one of the most widely applied theories in predicting and guiding health behavior [7]. Meanwhile, the study confirmed that the perceived ability to perform a given behavior is strongly related to one's actual performance of the behavior [7].

In RA individuals, high self-efficacy was shown to be associated with better ability to cope with the disease, for example, daily living with RA and pain management [8]. Guo et al. enrolled 120 RA patients for a self-efficacy study [9]. The cohort was divided into the patients receiving self-efficient health education into the intervention group and which receiving conventional health education into the control group. The patients in the intervention group demonstrated an improved self-efficacy, thereby enhancing their quality of life. Joint protection is one of the major content in the care of RA. Niedermann et al. designed and validated a self-efficacy scale of joint protection (JP-SES) for RA patients based on several steps [10] which showed that Cronbach's  $\alpha$  coefficient was 0.92 and good test–retest reliability ( $r_s = 0.79$ ;  $P < 0.001$ ), indicating a good internal consistency and thus clinical applicability on individual level [11]. The value of the JP-SES is to provide information on the patient's perceived ability to perform joint protection (JP) and to help plan treatment which could help stimulate the use of self-efficacy-enhancing methods in JP education [11]. However, the convergent and discriminant validity of the JP-SES in the original study [11] was not established. Garratt et al. stated that the JP-SES was evaluated using modern psychometric methods but required further evaluation before application [12]. The JP-SES could assess the effect of self-efficacy-enhancing methods (e.g., individual goal setting) [13]. In China, research on the joint protection of patients with

rheumatoid arthritis is at an infancy stage and no scale is available for assessment of patients' self-efficacy on joint protection.

To date, the structural validity and convergent and discriminant validity and test–retest reliability of the JP-SES have been thoroughly examined in clinical samples. Therefore, the aim of the current study was to examine the structural validity and internal consistency and test–retest reliability and correlations of the Chinese version JP-SES in a clinical sample of outpatients with RA.

**Availability of data and material** No additional data are available.

## Methods

### Design

This observational study used a cross-sectional survey method and was divided into two steps: (1) translation of the English version of JP-SES into Chinese version and (2) validation of the C-JP-SES in RA patients in November 2017.

### Data collection

Base on the requirements of factor analysis, we need a random sample of 115 patients with rheumatoid arthritis in this survey between November 2017 and August 2018. The patients who do not have known cognitive impairments or literacy problems.

**The requirements of sample size in factor analysis** The ratio between the proportion of the sample size and the number of items should be above 5:1. In fact, the ideal size of sample should be 10–25 times of the number of items. In this research, the size of samples has met the minimum requirement.

According to the Chinese law for medical research with humans, ethical approval was indicated for this survey study.

### Participants

**Patients** People with RA attending the outpatient facility of a hospital's rheumatology department participated in the scale translation. The Hospital Research Ethics Committee approved the study protocol and patients provided informed consent prior to participation. Before beginning the study, the respondents were informed about the investigation aim, subjects' rights, and investigators' obligations. The investigators used uniform advice language to explain the requirements for filling the questionnaires. All scales have been filled out by patients. The privacy of the participants was protected during the whole study.

Survey was sent between November 2017 and August 2018 to a random sample of 115 patients with doctor-confirmed RA identified through the rheumatology department. Only patients who had visited the outpatient rheumatology clinic over 1 year were included in this research. We were randomly to select patients in the database.

Inclusion criteria: (1) meeting the ACR/EULAR diagnostic classification criteria [14]; (2) conscious and exhibited a comprehension ability; (3) aged > 18 years; (4) no deformed limb, Barthel Index [15] (BI) > 40; (5) no previous surgery; and (6) written informed consent. Exclusion criteria: (1) nervous system diseases, such as Alzheimer's disease that influenced reading and comprehension; and (2) symptoms such as deafness and aphasia and inability to communicate with others.

According to the Chinese law for medical research with humans, Tianjin Hospital Medical ethics committee gave approval for this survey study (TJYY-2017-YLS-036).

The survey was performed self-administered. Previously, the investigators explained the survey purpose, rights, and obligations and gained consent from the respondents. The privacy of the respondents was protected during the investigation process, and all the scales were collected in 20 min. At the end of the survey, patients were asked if they were willing to complete the C-JP-SES a second time approximately 6 months later.

### Translation of the C-JP-SES

The original German/English version JP-SES was composed of 10 items. The original JPSES was published in English with English and German items – t. The questions are anchored in the statement “I am confident that I can care for my joints, even when I...” during a variety of situations. Each item is scored on a 0–3 scale (from 0 = .. to 3 = ), providing a total score from 0 to 30 where 30 is the best possible JP self-efficacy” [10].

Each item of the original JP-SES was translated into the initial Chinese version by a doctor and a nurse in joint department from Tianjin. Then, the Chinese version was translated back to the English version, and reviewed by the original author (KN). According to her suggestions, the final version of C-JP-SES was adapted and confirmed after discussion. The final Chinese version consists of ... items and measures the confidence to perform joint protection methods also on a 4-point-scale with 0 = not at all confident to 3 = very confident.

### Other scales for validation

The Arthritis Self-Efficacy Scale-8 (ASES-8) is mainly used to investigate the self-efficacy level of RA patients related to pain, function, and other symptoms of arthritis

[16]. It uses a 10-point scale (from 1 to 10), the final score is the average value of all the items, and a higher score indicates higher self-efficacy. The Chinese version ASES-8 was found to have good internal consistency (Cronbach's  $\alpha$  coefficient 0.92) and test–retest reliability (intraclass correlation coefficient 0.896) in Chinese RA patients [17]. The Laffrey Health Conception Scale (LHCS) assesses the understanding and opinion on health [17]. The English version was translated into Chinese by Huang et al. to enhance cultural suitability of the Chinese version [18]. The scale uses 6-point scale (from 1 = very disagree to 6 = very agree), the total score is between 27 and 162, and a higher score indicates better health conception. The final Chinese version of LHCS exhibited good reliability and validity. The Cronbach's  $\alpha$  coefficient was 0.91, i.e., good internal consistency for application in individuals [19]. The perceived efficacy of patient-physician interactions (PEPPI-10) was developed to assess the confidence of patients while communicating with health professionals [20]. The PEPPI-10 had two English versions: 10-item full-scale and 5-item simple scale. Both used the 11-point scale (from 0 = no confidence to 10 = very confidence), providing a score range of the scale from 0 to 100. A high score indicates better patient-physician interaction ability. Cronbach's  $\alpha$  coefficients of PEPPI-10 were 0.91 [21] that exhibited reliable theoretical basis and feasibility in clinical research. The CPEPPI-10 has good validity in patients with severe knee osteoarthritis (Cronbach's  $\alpha$  coefficient 0.907) [22].

Disease Activity Score-28 (DAS-28) is a reliabilized assessment for disease activities of adults with RA. Now it widely used for assess disease degree of rheumatoid arthritis in the world. The tool includes 3 measurements: erythrocyte sedimentation rate (ERS), number of swollen joints and number of painful joints. This score is a reliable and valid assessment of current disease activity[23]. Health Assessment Questionnaire (HAQ) often used in assessment for the physical function in daily activities or related yeild. It consists of 8 sub-scales and contains 20 items. Total score ranging between 0 (no or minimal dysfunction) to 3 (severe dysfunction) [24].

### Statistical analysis

Start with which statistical approaches you used SPSS19.0 software (IBM, 2010) LISREL 8.7 (Scientific Software International, Lincolnwood, IL, USA). We analyze item missing data and frequencies after data collection. Structural validity was examined using confirmatory factor analysis (CFA) with LISREL 8.70. Distributional properties of the JP-SES were inspected to examine the normality of the total scores and to identify possible floor and ceiling effects. Floor or ceiling effects were considered to be

present if > 15% of the patients scored the worst or best possible score on the JP-SES, respectively [25]. To test whether the JP-SES items measure a unidimensional construct, a one-factor model was fit to the data. Given the ordinal nature of the items, robust maximum likelihood estimation with Satorra–Bentler (SB) scaled statistics was used [26]. Besides the SB chi-square statistic ( $SB \chi^2$ ), where smaller values indicate better fit, the non-normed fit index (NNFI), the comparative fit index (CFI), the standardized root mean square residual (SRMR), and the root mean square error of approximation (RMSEA) were used to examine the model fit. NNFI and CFI values  $\geq 0.95$  and SRMR and RMSEA values  $\leq 0.08$  and 0.06, respectively, were considered indicative of good model fit [27, 28]. Cronbach's  $\alpha$  coefficient was used to evaluate the internal consistency of the Chinese version JP-SES. Cronbach's  $\alpha$  coefficient indicated the average split-half reliability coefficient of all the possible items, which was the most common measurement of validity [29]. The score range of Cronbach's  $\alpha$  coefficient was 0–1: 0 indicated no correlation among the items in the scale, and 1 indicated a perfect correlation among the items in the scale. The study proved that Cronbach's  $\alpha$  coefficient measured the internal consistency of the scale [30]. Cronbach's  $\alpha$  coefficient > 0.7 represented good internal consistency of the scale, which can be used in clinical research [31]. Test–retest reliability of the C-JP-SES scores was assessed by kappa score and intraclass correlation coefficient (ICC) with 95% confidence intervals using a two-way mixed effects model with absolute agreement for single measurements [32]. An ICC  $\geq 0.70$  was considered adequate for group level comparisons [31]. Individual agreement between test and retest scores of the Chinese version JP-SES was examined using Bland–Altman analysis [33]. Test–retest reliability, using the Cohen's kappa, was calculated in patients. The following values of Cohen's kappa were used to evaluate the level of agreement [34]: < 0 no agreement; 0.0–0.20 slight agreement; 0.21–0.40 fair agreement; 0.41–0.60 moderate agreement; 0.61–0.80 substantial agreement; and 0.81–1.0 perfect agreement.

Pearson's correlation between the sub-scales and total scale was used to indicate the consistency of the content in the Chinese version of JP-SES. If the score of JP-SES showed normal distribution, Pearson's correlation analysis was used, or else, Spearman's correlation analysis was used;  $P < 0.05$  indicated statistical significance. In this research, we use two-sided test to test whether these factors could be correlations. We supposed that the Chinese version JP-SES has low or moderate correlation with scores for the other instruments and strong correlation with BMI. The correlation coefficient was used with values of 0.20–0.39, 0.40–0.59, 0.60–0.79, and 0.80–1.0 representing weak, moderate, strong, and very strong correlations, respectively [27].

## Results

### Pre-testing

Five outpatients with RA at the Tianjin Hospital were recruited for preliminary testing of the readability and feasibility of the scale. The patients evaluated the specific contents of the scale, and in discussion with the staff (Table 1). The pre-testing results showed that the C-JP-SES has good readability in RA patients. So, we had to adjust formulations of the C-JP-SES.

### Patients

Of the 115 participants recruited, 10 were excluded because of missing responses in the C-JP-SES, leaving 105 for analysis. The demographic and clinical characteristics of the enrolled patients are shown in Table 2. The median (IQR) score of the patients in the C-JP-SES was 15.6 (0.6).

### Results of the adaption phase

During the adaption process of the JP-SES, the researchers encountered unclear concept and grammar that were influenced by linguistic cultural background. Through discussion, the researchers reached a consensus on the most appropriate terminology to help Chinese patients understand the scale. Table S1 presents the results of the back-translation, issues, and agreement for each JP-SES items. The results show that different cultural backgrounds were taken into account in the adaptation to enable patients' understanding of the items (Table S1). The researchers believe that the aim of adapting the C-JP-SES has been achieved.

### Distribution property

The C-JP-SES had non-normal distribution, albeit with small-scale skewness (skewness 0.064, kurtosis  $-0.889$ ). The highest score of JP-SES was 29, and the lowest was 4 in this study (Fig. 1). The results of the Chinese version of JP-SES survey did not comply with regular normal distribution.

### Structural validity and internal consistency

Confirmatory factor analysis (CFA) showed good fit indices for a unidimensional model of the JP-SES (chi-square = 48.37,  $df = 35$ ,  $P$  value = 0.066, root mean square error of approximation (RMSEA, 90%CI) = 0.061 (0.0; 0.099),  $SB\chi^2(35) = 1.38$ , NNFI = 0.99, CFI = 0.99, SRMR = 0.041),

**Table 1** Pre-testing Patient characteristics ( $N = 5$ )

Age (year)	Sex	Education	Duration (year)	BMI	DAS-28	HAQ	JP-SES
34	Male	High	3	21.6	4.71	1.8	16
52	Female	Medium	5	19.8	4.23	1.2	21
47	Male	Low	2	23.2	4.07	1.5	18
33	Male	Medium	4	22.4	4.57	2.0	18
24	Female	High	2	20.7	5.25	1.65	15

with the exception of the root mean square error of approximation. Standardized factor loading ranged between 0.67 for item 6 and 0.79 for item 1 (Fig. 2). Our results showed that Cronbach’s  $\alpha$  coefficient of the C-JP-SES was 0.922 with sufficiently high internal consistency. Hence, our results confirm the Chinese version JP-SES fit unidimensionality.

**Test-retest reliability**

We carried out the test-retest reliability in patients who investigated in this research. In test-retest research, 4 were excluded because of missing responses in the C-JP-SES, leaving 101 for analysis. With substantial kappa coefficient (0.653) (Table 3) and an ICC of 0.94 (95% CI 0.85–0.95), test-retest reliability of the

C-JP-SES was over-top the cut-off point for group level comparisons. Additional Bland–Altman analysis preliminary confirmed that the limits of agreement between the two time points were relatively narrow, ranging from  $-3.8$  to  $4.1$  (Fig. 3).

**Correlation**

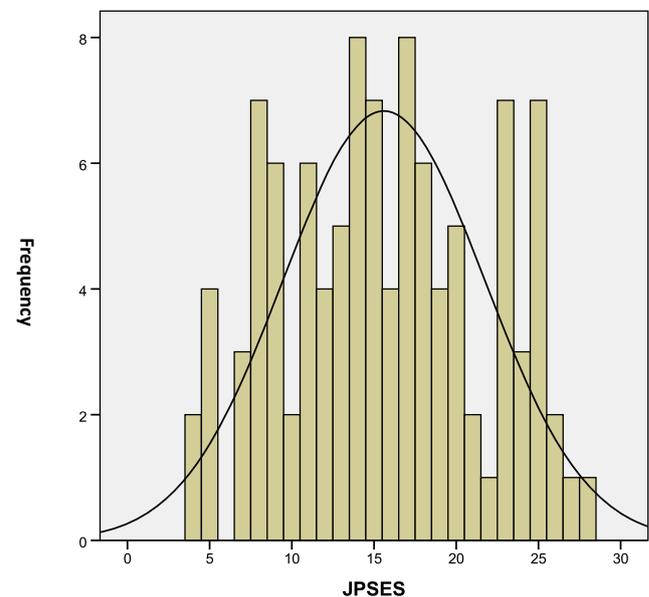
The results of Spearman’s correlation analysis indicated that the JP-SES moderately correlated with health, arthritis, communication self-efficacy scales, duration, and body mass index (BMI). The results show that the C-JP-SES had weak but significant correlation with PEPPI-10 ( $r = -0.326, P < 0.01$ ), ASES-8 ( $r = 0.263, P < 0.01$ ), and duration ( $r = 0.274, P < 0.01$ ), which had moderate but significant correlation with BMI ( $r = -0.438, P < 0.01$ ) and DAS-28 ( $r = -0.493, P < 0.01$ ). And, what is more, it had strong and significant correlation with HAQ ( $r = -0.644, P < 0.01$ ). Meanwhile, we found that the Chinese version JP-SES has no correlation with HC ( $r = -0.110, P > 0.05$ ), age ( $r = 0.024, P > 0.05$ ), sex ( $r = 0.116, P > 0.05$ ), and education ( $r = -0.088, P > 0.05$ ) (Table 4).

**Table 2** Patient characteristics ( $N = 105$ )

Characteristics	Median (IQR) or number (%)
Age (years)	55 (5)
Sex (female)	84 (80.0%)
Ethnicity (Han nationality)	99 (94.3%)
Education <sup>a</sup>	
Low	6 (5.7%)
Medium	66 (62.9%)
High	33 (31.4%)
Disease duration	8.2 (1.2)
BMI	20.7 (0.2)
CJP-SES (range 0–30)	15.6 (0.6)
ASES-8 (range 1–10)	7.8 (0.2)
LHCS (range 27–162)	97.49 (4.3)
PEPPI (range 0–100)	80.4 (1.4)
DAS-28 (range 0–9.4)	4.98 (0.6)
HAQ (range 0–3)	2.05 (0.5)

CJP-SES Chinese Joint Protection Self-Efficacy Scale, ASES-8 Arthritis Self-Efficacy Scale-8, LHCS Laffrey Health Conception Scale, PEPPI Perceived Efficacy in Patient-Physician Interactions Scale, BMI Body Mass Index, DAS-28 Disease Activity Score-28, HAQ Health Assessment Questionnaire

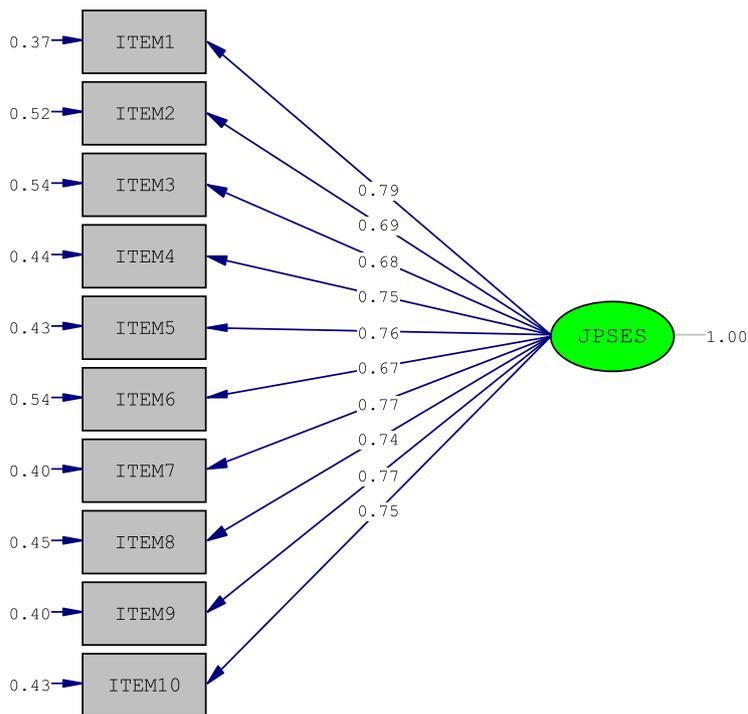
<sup>a</sup> Low education = none, primary school, low-level vocational training, low-level secondary general education; medium = middle-level vocational training, high-level secondary general education; high = high-level vocational training, academic education



**Fig. 1** Patients’ JP-SES score distribution. Mean = 15.6, standard deviation (line) = 6.13,  $N = 105$ . JP-SES Joint Protection of Self-Efficacy Scale

**Note: Mean =15.6, Standard deviation (line) =6.13, N=105.**

**Abbreviation: JP-SES, Joint Protection of Self-Efficacy Scale**



Chi-Square=48.37, df=35, P-value=0.06579, RMSEA=0.061

**Fig. 2** Standardized factor loading and residuals for the items of the JP-SES. *JP-SES* Joint Protection Self-Efficacy Scale

**Discussion**

This study thoroughly examines the validity and test–retest reliability of the C-JP-SES in a specific clinical population. The findings of the study indicate that the C-JP-SES is sufficiently valid and reliable to measure joint protection to interact with physicians in patients with RA. The Chinese version of JP-SES can be used as an evaluation scale for measuring the ability of joint protection in patients with RA, because the scale is simple and that has good validity. Our results show that the C-JP-SES fit unidimensional model.

The results of confirmatory factor analysis confirmed that the C-JP-SES measures a unidimensional construct. CFA can

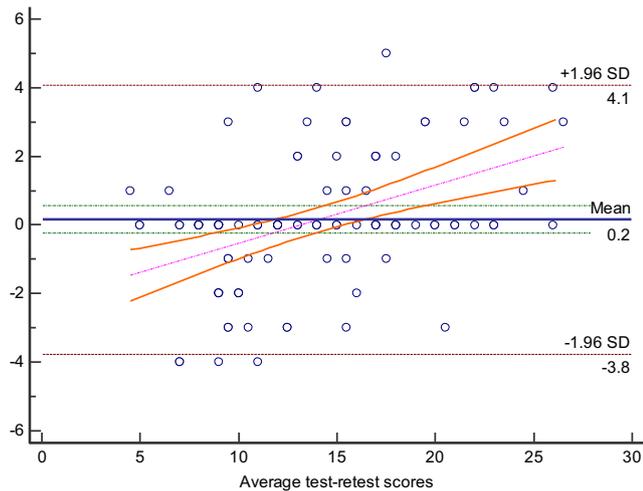
provide a powerful test on structural validity. In this research, the results of CFA confirmed that the model of the C-JP-SES adequately fits the data of the clinical sample. All fit indices that completely fit for unidimensional model. But we cannot explain why these values are above/under the recommended cutoff. However, previous studies showed that few degrees of freedom RMSEA values can be inflated in sample model [30]. Moreover, the C-JP-SES demonstrated high internal consistency, also indicating that the items all measure the same concept. Cronbach’s  $\alpha$  of the scale was the same as reported in the original validation study and suggests that the scale has sufficient precision for clinical applications and individual comparisons.

**Table 3** Symmetry measure of the Chinese version JP-SES

		Value	Asymptotic standard error <sup>a</sup>	Approximation $T^b$	$P$
Coherence measure	Kappa	0.653	0.049	26.588	0.000
Effective cases	$N$	101			

<sup>a</sup>No assumption of zero

<sup>b</sup>Assuming zero hypothesis using asymptotic standard error



**Fig. 3** Individual agreement between test and retest scores of the CJP-SES. The horizontal solid line represents the mean difference between both scores. The dashed line represents the linear regression line through the data points. The outer dashed lines represent the 95% limits of agreement (mean difference  $\pm$  1.96 SD of the difference)

It is very important that high test-retest reliability can discriminate between both scores in the sample of patients [25]. According to its internal consistency, test-retest reliability of the C-JP-SES was well above the minimum standard of 0.70, which is assumed to indicate that a measure is sufficiently reliable for group level comparisons. The kappa coefficient of the scale was 0.653, indicating a substantial agreement between the assessments. The additional Bland-Altman analysis demonstrated that the predominant source of error was not significant. Because of the limitation of experimental condition and time period, 6 months between the repeated questionnaires is used to assess test-retest reliability in this study, which may have been too long to assure that no inter-individual variation occurred. Compared with the study of the original version JP-SES, the participants were re-sent the questionnaire for

reliability testing approximately 3 weeks later [10]. Future studies should thus examine test-retest reliability and agreement in 2 or 3 weeks.

The results of the correlations between C-JP-SES and other questionnaires supported the discriminant validity and convergent of the C-JP-SES. The reason of this result may be that the LHCS main used for assess the overall ability of health behaviours in adults. LHCS usually measures a personality trait which is too broad. But the C-JP-SES had significant correlation with ASES-8, PEPPi-10, DAS-28, HAQ, duration and BMI. Sherer et al. [35] thought that general self-efficacy in the general case influences expectations in new situations, others argued that specific self-efficacy does not assess by General Self-Efficacy Scale (GSES) [36]. Therefore, the construct validity of the C-JP-SES in clinical samples would be assessed using more comparable, domain specific measures of joint protection in the future.

The limitations of this study are that (1) the number of patients in pre-testing involved is low, even now the results of five patients were not included, but that influenced the comprehensive and relevance of self-efficacy; (2) there is no fund for this research, so we did not test Rasch analysis. Despite the above mentioned limitations, we believe that our conclusions are well supportive of the validity of the C-JP-SES in patient with RA population. In addition, the small sample size influenced the persuasion of the evidence and the results. Because the number of samples is not larger, so the item location precision must be sufficient in the research [19]. As the C-JP-SES has well-targeted, so the requirements of the sample size reduced and vice versa. In this research, that can not challenge the validity of the C-JP-SES.

Based on these results, the further research orientations are that further research orientations are (1) evaluate sensitivity to change, responsiveness, (2) evaluate the Chines JPSES in other populations than RA, and (3) provide electronic forms of

**Table 4** Spearman’s correlations between CJP-SES and other measures

		ASES-8	LHCS	PEPPI	DAS-28	HAQ	Duration	BMI
CJP-SES	Spearman’s correlations	0.263*	-0.110	0.326**	-0.493**	-0.644**	0.274**	-0.438**
	Sig	0.007	0.263	0.001	0.001	0.001	0.005	0.001
	N	105	105	105	105	105	105	105
	Bootstrap <sup>a</sup>							
	Deviation	0.000	0.002	0.001	0.008	0.004	-0.004	0.006
	Standard error	0.093	0.103	0.098	0.100	0.072	0.094	0.085
	95%CI							
	Floor	0.077	-0.317	0.133	-0.671	-0.766	0.075	-0.588
	Ceiling	0.437	0.100	0.526	-0.280	-0.490	0.448	-0.254

\*  $P < 0.05$

\*\*  $P < 0.01$

<sup>a</sup> The bootstrap results are based on 1000 bootstrap samples

the JP-SES; further evidence will be required before the scale is used in other types of arthritis.

## Conclusion

Our research showed that the C-JP-SES has a good construct validity, internal consistency, and satisfactory criterion-related validity. This scale can help doctors and nurses to assess the JP self-efficacy of patients with RA. Although the scale demonstrated validity in our study, further research will be required to provide the evidence for other psychometric properties, especially sensitivity to change.

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**Authors' contribution** Huiwen Zhao has received research approval from Tianjin Hospital. Wen Luo has received the authorization of using the JP-SES in Chinese/China from Karin Niedermann. Wen Luo, Xiuli Zhang and Xiuli Liu translated the JP-SES into Chinese; Wen Luo and Karin Niedermann and revised the back-translated scale. Xiuli Zhang, Xiuchan Liu and Zihan Yang performed data collection from participants and data analysis.

Wen H Zhao<sup>1</sup> and Li X Zhang wrote the manuscript under the supervision of Wen Luo and advised by Karin Niedermann.

## Compliance with ethical standards

**Disclosures** None.

**Ethical approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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