

# Revision of the Self-rating Scale of Systemic Family Dynamics Based on the Applicability among College Students in Southwest China

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**Abstract:** *Objective:* To revise the self-rating scale of systemic family dynamics (SSFD) based on its applicability among college students in southwest China. *Methods:* The study conducted a survey using the Chinese version of the self-rating scale of systemic family dynamics (SSFD) and the Center for Epidemiological Studies depression scale (CES-D) on 3,122 college students from Sichuan, Chongqing, and Guizhou. Exploratory factor analysis was performed on the items of SSFD by SPSS, followed by confirmatory factor analysis by Amos. *Results:* Based on the factor analysis, the systemic logic dimension of the original scale was removed, retaining three dimensions: family atmosphere, individualization, and disease concepts. The number of items was reduced from 23 to 14. The revised scale's overall Cronbach's alpha was 0.914, with dimension-specific Cronbach's alpha ranging from 0.689 to 0.905. All dimensions and the total score of the revised SSFD showed significant negative correlations with depression (-0.193\*\*, -0.237\*\*, -0.086\*\*, -0.168\*\*). The confirmatory factor analysis showed good fit indices (GFI = 0.943, IFI = 0.950, CFI = 0.950, NFI = 0.944, RMSEA = 0.069, SMRA = 0.037). *Conclusion:* The revised SISFD scale features a clear structure and meets measurement standards, making it suitable for measuring systemic family dynamics among southwest China college students.

**Keywords:** Systemic family dynamics; Depression; Exploratory factor analysis (EFA); Confirmatory factor analysis (CFA)

**Online publication:** July 9, 2024

## 1. Introduction

Research on systemic family dynamics originated in the 1950s and developed alongside the study of family therapy <sup>[1]</sup>. According to the Heidelberg perspective, systemic family dynamics can be measured through seven dimensions: systemic logic, individualization, family atmosphere, concepts of illness, relational control, relational actuality, and temporal organization. These dimensions reflect the cognitive, emotional, and interactive behaviors within the family. This multidimensional approach provides more comprehensive information about the internal dynamics of families. The self-rating scale of systemic family dynamics (SSFD),

developed in 2000 by Kang et al. based on the Heidelberg School's theory of family dynamics, is the only indigenously developed scale of systemic family dynamics to date<sup>[2]</sup>. Yang et al. conducted its initial revision in 2002, and it was subsequently revised again in 2014 by Zeng et al., tailored to the applicability among college students<sup>[3]</sup>. The revised scale includes four dimensions: family atmosphere, individualization, systemic logic, and concepts of illness, with 23 items<sup>[4]</sup>. Although the revised scale showed good reliability and validity and was suitable for college students, the sample subjects were all from universities in Guangdong Province. Due to regional, cultural, and economic differences, the applicability of this scale to college students in the southwest region of China still needs further verification. Therefore, this study aims to examine the applicability of this scale among college students in the southwest region and to establish a second-order factor model based on the revised scale.

## 2. Participants and methods

### 2.1. Participants

This study employed random sampling and distributed questionnaires to 3152 college students in Sichuan, Guizhou, and Chongqing via Sojump from early October to the end of November 2022. 3122 valid questionnaires were collected, resulting in a 99.0% effective response rate. Of these, 1592 were randomly selected as Sample I for exploratory factor analysis, while the remaining 1530 would be Sample II for confirmatory factor analysis. The distribution of overall sample characteristics across sociodemographic features is shown in **Table 1**.

**Table 1.** Distribution of participants across sociodemographic characteristics

Factor	Sample Size (N)	Ratio
Gender		
Male	633	20.30%
Female	2589	79.70%
Original Area		
Town	1003	32.10%
Countryside	2119	67.90%
Location of College		
Chongqing	1890	60.50%
Sichuan	915	29.30%
Guizhou	317	10.20%
Only Child or Not		
Yes	687	22.00%
No	2435	78.00%
Total	3122	100%

### 2.2. Data quality control

The questionnaire was developed by a researcher with a master's degree in applied psychology, a full-time teacher long engaged in college student mental health education. The instructions were carefully designed, and applied psychology experts were invited to review the appropriateness of these instructions rigorously. Additionally, before distributing the questionnaires, the researchers provided a uniform explanation of the

questionnaire filling requirements. Through controlling the questionnaire design and distribution process, efforts were made to minimize the bias caused by common method variance.

## **2.3. Measurements**

### **2.3.1. Sociodemographic features survey**

Based on the literature review and the objectives of the study, this survey includes variables such as gender, place of origin, location of the school, and whether the individual is an only child.

### **2.3.2. Self-Rating scale of systemic family dynamics (SSFD)**

This scale was revised in 2014 by Zeng Weinan et al., targeting college students in Guangdong Province <sup>[4]</sup>. It includes four dimensions: family atmosphere, individualization, systemic logic, and concepts of illness, with 23 items scored on a 1–5 scale. The options range from “completely disagree” to “completely agree.” A higher score indicates better systemic family dynamics characteristics. The Cronbach’s alpha coefficients for the dimensions are 0.838, 0.788, 0.711, and 0.688, respectively. The confirmatory factor analysis showed good fit indices, reliability, and validity.

### **2.3.3. Center for epidemiological studies depression scale (CES-D)**

This scale was revised by Zhang Jie et al. and is used to screen for symptoms of depression <sup>[5]</sup>. It consists of 20 items scored on a 1–4 scale, with options ranging from “rarely or none of the time” to “most or all of the time.” Higher scores indicate severe depressive symptoms. This scale will be used to examine the criterion validity of the revised self-rating scale of systemic family dynamics. The Cronbach’s alpha coefficient for this scale in this study is 0.864.

## **2.4. Statistical analysis**

### **2.4.1. Exploratory factor analysis**

This study conducted an exploratory factor analysis and examination of scale-related validity using SPSS 27.0 on data from Sample I.

### **2.4.2. Confirmatory factor analysis**

This study used Amos 24.0 to conduct confirmatory factor analysis on data from Sample II to examine the revised scale’s validity and establish a second-order factor model.

## **3. Results**

### **3.1. Common method bias**

The study is designed as an anonymous survey to reduce common method variance associated with self-reporting. The participants were informed that there were no right or wrong answers and that the data would only be used for academic research to minimize social desirability bias. Additionally, results from Harman’s single-factor test based on EFA showed four factors with eigenvalues greater than 1; the first factor accounted for 34.97% of the variance, below the critical threshold of 40% <sup>[6]</sup>. All the outcomes suggest that the bias caused by common method variance is not severe, allowing for further factor analysis.

### **3.2. Reliability analysis of the original scale dimensions**

Reliability analysis was conducted on the 23-item scale using data from Sample I. The overall scale and the

dimensions of family atmosphere, individualization, systemic logic, and concepts of illness had Cronbach's alpha coefficients of 0.880, 0.799, 0.862, 0.727, and 0.679, respectively. These results indicate that the internal consistency meets measurement requirements. However, the items representing systemic logic (items 5, 9, 11, 16, 18) showed correlations less than 0.1 with other items, suggesting that this factor may be independent of the other three factors [7]. Although the application to college students in Guangdong Province supports this factor as part of SSFD, it appears not to apply to college students in Southwest China. Therefore, it is considered to exclude the systemic logic factor represented by these items from the overall scale.

### 3.3. Exploratory factor analysis

After removing those items, the remaining 18 items had a KMO coefficient of 0.943, and Bartlett's test of sphericity was significant. The MSA values for individual items were all above 0.50, making them suitable for exploratory factor analysis. Using SPSS 27.0, principal component analysis with an oblique rotation method was applied, fixing the number of factors at three [8]. Each factor's item loading was above 0.4, explaining 52.10% of the variance. Item 12 exhibited cross-loadings and is also a reverse-scored item. Studies showed that reverse-scored items tend to be more problematic than beneficial in measurement [9]. Thus, it was considered for removal. Additionally, the meaning of items 21 and 7 differed significantly from other items within their respective factors. Based on considerations of face validity, it was decided to remove these two items from the scale. Removing them individually and conducting exploratory factor analysis again, the explained total variance increased to 54.704%. The resulting structure matrix (factor structure and loadings) and the factor correlation matrix are shown in **Tables 2** and **Table 3**, respectively.

**Table 2.** Structure matrix of the 14-item, 3-factor SSFD

Index	Family atmosphere	Individualization	Disease concept	Content of item
19	0.935			I feel that my family is very united and cooperative.
17	0.899			My family members are relaxed and happy when together and can speak freely.
13	0.733			It is easy for family members to express warmth and care for each other.
15	0.679			All family members have a say in major family decisions.
22	0.631			Family members can see each other's strengths and weaknesses.
6	0.554			Family members take pride in their closeness to each other
4		0.812		Children in my family are very free to make their own decisions.
2		0.789		My parents allow me to freely develop my interests and hobbies.
1		0.753		My family allows family members to live in their own way.
8		0.702		I can arrange my own time.
10		0.489		My parents do not use strict rules to control me.
20			0.741	My family believes that the occurrence of psychological problems is related to the family environment.
23			0.714	My family believes that mental illnesses are significantly related to an individual's lifestyle.
14			0.506	My family believes that certain diseases are related to tensions in interpersonal relationships.



**Table 3.** Factor correlation matrix

Factor	Family atmosphere	Individualization	Disease concept
Family Atmosphere	1	0.720**	0.621**
Individualization	0.720**	1	0.476**
Disease Concept	0.621**	0.476**	1

Note: \*\*means  $P < 0.01$ ; \*means  $P < 0.05$ . Below is the same.

### 3.4. Internal consistency reliability

After revising, the Cronbach's alpha coefficients for the 14-item overall scale and the subscales for family atmosphere, individualization, and concepts of illness were 0.914, 0.905, 0.853, and 0.689, respectively. The revised scale's Cronbach's alpha coefficients improved, indicating higher homogeneity reliability after the deletion of related items.

### 3.5. Criterion-related validity

Using the total score of CES-D as the criterion, the criterion-related validity of the scores for each factor and the total score of the 14-item scale was calculated, with results shown in **Table 4**. Scores of each subscale and the total scale showed a significant negative correlation with depression, indicating that the revised 14-item, 3-factor SSFD has good criterion-related validity.

**Table 4.** Criterion-related correlation coefficients between revised SSFD and depression

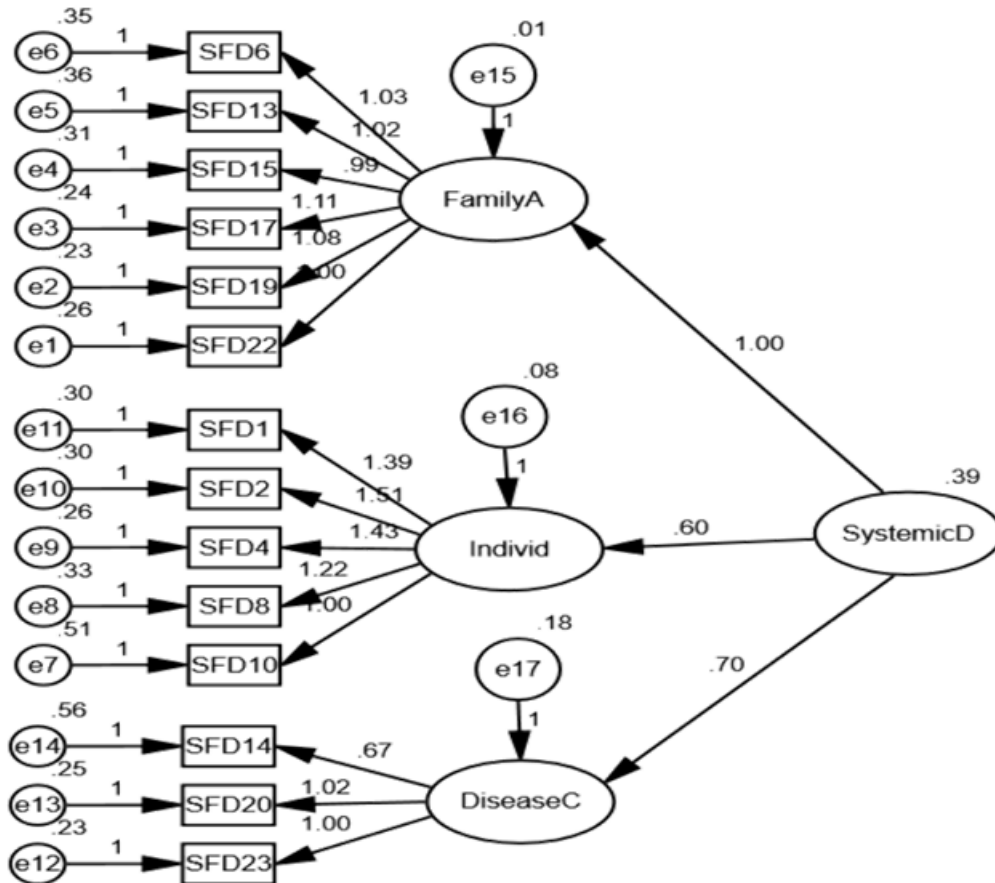
	Family atmosphere	Individualization	Disease concept	Total score of revised SSFD
Depression	-0.193**	-0.237**	-0.086**	-0.168**

### 3.6. Confirmatory factor analysis

Confirmatory factor analysis was conducted on the 14-item, 3-factor structure of the scale by Amos. The fit indices are as follows:  $\chi^2/df = 8.568$ , RMSEA = 0.070 < 0.08, SRMA = 0.037 < 0.05, NFI = 0.944 > 0.90, IFI = 0.950 > 0.90, CFI = 0.950 > 0.90, AGFI = 0.919 > 0.90. The relatively high  $\chi^2/df$  is due to the large sample size of over 1500 used in the confirmatory factor analysis, which can influence the chi-square value. The principle is that the larger the sample size, the larger the chi-square value. In such cases, other fit indices must be considered to evaluate the model, and as the results show, all other fit indices performed well<sup>[10]</sup>. It can be shown that the 3-factor model with 14 items fits well with the retest data. The results of the confirmatory factor analysis are shown in **Table 5**, and the second-order factor model is shown in **Figure 1**.

**Table 5.** The outcome of confirmatory factor analysis

Factor	Standardized factor loading for each item
Family atmosphere	SFD6/0.74, SFD13/0.73, SFD15/0.75, SFD17/0.82, SFD19/0.82, SFD22/0.61
Individualization	SFD1/0.77, SFD2/0.79, SFD4/0.80, SFD8/0.71, SFD10/0.55
Disease concept	SFD14/0.47, SFD20/0.78, SFD23/0.78



**Figure 1.** Second-Order Factor Model of the Revised SSFD. FamilyA represents family atmosphere, Individ represents individualization, and DiseaseC represents disease perception. The loadings shown in the figure are unstandardized values.

#### 4. Discussion

The scale revision has reduced the original 4 dimensions to 3 dimensions and reduced the number of items from 23 to 14. The internal consistency and reliability of the scale have improved. From a theoretical perspective, removing the entire system logic factor from the scale will affect the scale’s comprehensiveness in explaining the family dynamics system. However, from a practical standpoint, using any scale needs to consider cultural adaptability. The original 4-factor questionnaire was only validated for college students in Guangdong Province. Due to regional, economic, and cultural differences, its adaptability to college students in the southwestern region needs further consideration. The data collected from college students in southwestern China in this study supported the reduction in exploratory and confirmatory factor analyses. Additionally, the deletion of the entire system logic factor in this revision does not imply that this factor is unimportant for assessing the feature of systemic family dynamics. Instead, it suggests that it should exist independently from the other three factors. Researchers can investigate the impact of system logic on various aspects of college student’s mental health as a separate part rather than combining it with the other three factors to form a single construct. Therefore, both from a practical and theoretical perspective, this reduction is reasonable.

In the revised scale, the attribution of the retained items has not changed. However, the content of the scale is more concise, and the internal consistency and reliability of each dimension and the total scale have improved. The results of confirmatory factor analysis using data from Sample Two indicated a good fit for the 3-factor scale structure model, which can be used to measure specific aspects of the systemic family

dynamics among college students in the southwestern area of China. Based on the content of the deleted system logic dimension items, this dimension mainly represents the acceptance of external perspectives by family members. The items retained in the three dimensions represent the cognitive and interaction patterns among family members. Therefore, the revised scale will be renamed the self-rating scale of internal systemic family dynamics (SISFD) in this study. Subsequent researchers can choose the scale based on their research objectives. If they need to study the relationship between family members and the outside world, they can consider the system logic as a factor independent of the other three factors.

Systemic family dynamics primarily manifest in their influence on individuals' mental health. The scores of the CES-D were used as criteria to test the criterion-related validity of the scale. The results showed a significant negative correlation between the scores of depression and the revised SISFD, including those of each subscale and the overall scale. All the outcomes mean that the better the performance of the system family dynamics, the lower the level of depression, which is consistent with previous research<sup>[11]</sup>. It indicates that the revised SISFD can effectively predict the mental health of college students in the southwestern region to some extent.

In conclusion, the revised 14-item, 3-factor SISFD demonstrates good reliability and validity. It can be used to measure the internal dynamics characteristics of the system family among college students in the southwestern area of China.

## Funding

Sichuan Provincial Department of Education 2022 Research Topics on Mental Health Education in Schools and Universities Across the Province  
Project number: 2022SXJP007

## Disclosure statement

The authors declare no conflict of interest.

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