Measurement invariance and country difference in children's social skills development: Evidence from Japanese and Chinese samples

Zhu Zhu[1,2] · Dandan Jiao[1] · Xiang Li[1] · Yantong Zhu[1] · Cunyoen Kim[3] · Ammara Ajmal[4] · Munenori Matsumoto[1] · Emiko Tanaka[5] · Etsuko Tomisaki[6] · Taeko Watanabe[7] · Yuko Sawada[8] · Tokie Anme[9]

Abstract

The diversity of child social skills development is not well detected among Asian countries. Culturally validated assessments are needed for practitioners to evaluate child social skills. This study tested the measurement invariance of the Social Skill Scale (SSS) across Japanese and Chinese samples and explored country differences in child social skills development. The SSS utilizes a widely used factor structure (assertion, self-control, and cooperation subdomains) and has established Japanese and Chinese versions. We conducted investigations with an identical process and materials with different language versions, collecting data from 931 Japanese kindergarten children ($M_{age} = 4.35$, $SD_{age} = 1.07$; 53.6% boys) and from 1130 Chinese kindergarten children ($M_{age} = 4.47$, $SD_{age} = 1.00$; 52.3% boys). We used multiple confirmatory factor analysis to test measurement invariance of the SSS and established the validity, reliability, and scalar measurement invariance for the first-order factor structure of the SSS across the two country samples. We also examined country differences on the associations between demographics, parenting practice, and child social skills development. We found that, compared to the Chinese sample, cooperation skills significantly increased more with age among the Japanese sample. However, spanking was negatively related to self-control skills development in both countries. Our findings contribute to the demonstration of the diversity of child social skills development and have important implications for assessing and developing child social skills using culture-specific strategies.

Keywords Social skill · Country difference · Measurement invariance · Spanking · China · Japan

Introduction

Social skills are defined as socially acceptable behaviors and the ability to interact appropriately with others (Gresham, 2016; Gresham & Elliott, 1984). Early childhood is a crucial period for social skills development during which even young children already have age-appropriate abilities of expressing themselves and communicating with others (Hosokawa & Katsura, 2017; Zhu et al., 2021). In academia, continuous debates are concerned with the consistency and differences of child social skills development across cultures and have resulted in an increase of cross-cultural research (Lamb and Lerner 2015). Multicultural studies contribute to the detection and understanding of the diversity and specific cultural features in child social skills development, both theoretically and practically.

✉ Tokie Anme
anmet@md.tsukuba.ac.jp

Extended author information available on the last page of the article

Cultural Factors in Child Social Skills Development

Bronfenbrenner's ecological systems theory advocates that child development is a result of interactions between biological characteristics and five dimensions of the environment (Aguiar et al., 2019; Hu et al., 2017). Country differences, including a variety of cultural values, customs, and laws, belong to the outermost layer of the ecological system, which is referred to as the macrosystem (Berk, 2000). Based on this theory, contextual variations across countries demonstrate different social expectations and lead to different caregiving values and common strategies, which influence when and how children acquire social skills. For example, a longitudinal study sampled from nine countries indicated that culture affected parenting styles and indirectly influenced children's externalizing behaviors; parents from cultures with higher authoritarian attitudes were associated with children with more externalizing behaviors (Lansford et al., 2018). Notably, there is one difficulty in the comparative studies:

Children's social skills cannot be compared across countries without first testing the measurement invariance.
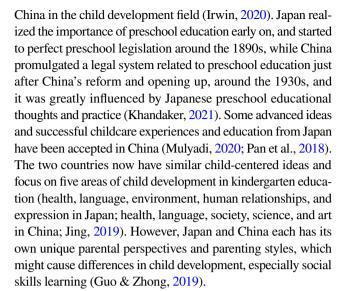
Social Skills Measurements in a Multicultural Context

Multimethod (i.e., observational methodology, verbal reports from interviews and questionnaires, structured laboratory tasks), multiple raters and contexts (i.e., parental ratings at home, teacher's ratings in school), and multiple transactional approaches have been developed to measure children's social skills (Gresham, 2016). Gresham and Elliott (1990) proposed the Social Behavior Analysis Framework and developed the Social Skills Rating System (SSRS) and its improved version, the Social Skills Rating System-Rating Scales (SSIS-RS), complete with versions for teachers or parents to evaluate age-related social skills. This scale is commonly used worldwide (Frey et al., 2011).

Research has demonstrated that SSRS could be used for both white and non-white groups and children in the 50 U.S. states as well as those in other countries such as Brazil and Norway (Walthall et al., 2005; Freitas & Del Prette, 2015; Gamst-Klaussen et al., 2016). However, adaptations of the scales have been almost entirely applied in English-speaking countries, while differences have been shown in countries where English is not the main language, such as populations that speak Farsi or Portuguese (Eslami et al., 2014; Major & Seabra-Santos, 2014). Some countries have further developed original scales based on the same SSRS framework to adapt it to their culture context. One such scale is the Social Skill Scale (SSS), which was developed based on SSRS and has been commonly used in Japan (Hosokawa & Katsura, 2017; Takahashi et al., 2008). The reliability and validity of the SSS was first established in a nationwide Japanese cohort study (Anme, Shinohara, et al., 2013; Anme, Tanaka, et al., 2013). A Chinese translated version of the SSS has been published online, and the first-order three-factor structure has also been established as having valid subdomains within a Chinese sample (Cheung et al., 2017; Child Care Power-up Group n.d.).

There are two major limitations in the existing research on social skill measurements. First, measurement (in-)variances have always been discussed between translated versions and the original U.S. version, while little is known about the measurement invariances between two non-English-speaking countries, which increases the difficulty of detecting the diversity of child social skills development. Second, although the factor structure has always been emphasized, differences in the primary factor loadings of scales should also be studied to show the effectiveness of the measurement in multicultural studies.

The Japanese and Chinese Preschool Contexts

Japan and China are two of the most populated Asian nations. There is a long history of communication between Japan and

China in the child development field (Irwin, 2020). Japan realized the importance of preschool education early on, and started to perfect preschool legislation around the 1890s, while China promulgated a legal system related to preschool education just after China's reform and opening up, around the 1930s, and it was greatly influenced by Japanese preschool educational thoughts and practice (Khandaker, 2021). Some advanced ideas and successful childcare experiences and education from Japan have been accepted in China (Mulyadi, 2020; Pan et al., 2018). The two countries now have similar child-centered ideas and focus on five areas of child development in kindergarten education (health, language, environment, human relationships, and expression in Japan; health, language, society, science, and art in China; Jing, 2019). However, Japan and China each has its own unique parental perspectives and parenting styles, which might cause differences in child development, especially social skills learning (Guo & Zhong, 2019).

Even as diversity among countries has been more emphasized recently, comparisons have always been conducted among Western countries or between Eastern and Western cultures (Chang et al., 2011; Peng, 2021). In order to detect the diversity of child social skills development in non-English speaking countries and Asian culture, it is necessary and possible to test the (in-)variances of social skills measurement and explore country differences in child social skills development between Japanese and Chinese samples. To the best of our knowledge, few empirical studies have compared Japanese and Chinese children's social skills development based on measurement invariance.

The Present Study

The purposes of the present study are (1) to test the measurement invariance of the SSS in Japanese and Chinese samples, and (2) to explore culture effects on social skill development. Accordingly, we hypothesized that (1) the SSS could be used in both Japanese and Chinese samples with measurement invariance; and (2) associations between demographic background, parenting practice, and child social skills development differ between Japan and China.

Methods

Study Design and Participants

We conducted a cross-sectional investigation with identical processes in Japan and China. Eleven kindergartens across Japan and seven kindergartens from the east and west of mainland China participated in the investigation. All participating kindergartens were urban community facilities with a quality that adheres to national standards. Participating children were recruited according to the following inclusion criteria: (1) aged between 3 and 6 years, and (2) living with

at least one parent. The exclusion criteria were (1) presence of disabilities, (2) medically diagnosed developmental delay, and (3) parents with health conditions that might interfere with study participation. Because of the COVID-19 pandemic, the Japanese leg of our investigation was conducted in 2019 (before the onset of the pandemic in Japan), and Chinese data were collected in 2021 (at which time COVID-19 had been under control in China). Teachers used the SSS to evaluate children's social skills based on daily observations in kindergarten. All teachers who participated were trained on the official scale and manual for at least two hours and obtained 80% and above consistency among pairs when two people were tested observing the same child. Parents were required to complete parent-report questionnaires regarding demographics and parenting practices, including parental involvement activities and spanking behaviors. All processes, surveys, and training contents were identical in Japan and China but were presented in the national language.

Based on the inclusion and exclusion criteria, 1099 Japanese children were recruited to participate in our survey, with written parental consent required for participation (return rate = 84.7%). A total of 168 children were excluded from the analysis due to missing data on either social skills or parenting practices, with a final Japanese sample of 931 children remaining ($M_{age} = 4.35$, $SD_{age} = 1.07$; 53.6% boys). A total of 1364 Chinese children were recruited with written parental consent (return rate = 82.8%). A total of 234 children were excluded from the analysis due to missing data on social skills, demographics, or parenting practice, and the data of 1130 children ($M_{age} = 4.47$, $SD_{age} = 1.00$; 52.3% boys) were included in the final Chinese sample.

Measurement

Social Skills

The SSS is an observation-based screening scale for teachers to assess child social skills in kindergartens or childcare centers (Anme, Shinohara, et al., 2013; Anme, Tanaka, et al., 2013). The SSS consists of 24 items with three subdomains: assertion, self-control, and cooperation. The assertion subdomain consists of eight items such as "Makes eye contact when speaking with others" and "Expresses appropriate greetings to others." The self-control subdomain comprises eight items such as "Behaves well as required by the situation" and "Does not interrupt another's speech." The cooperation subdomain contains eight items such as "Praises a friend's success" and "Helps friends without encouragement from others." Each item is assessed as rarely (0), sometimes (1), and frequently (2). The total score is calculated by summing all items in each subdomain or overall scale. A higher score indicates a higher level of social skills.

Parenting Practice

Parenting practice was assessed for two aspects: parental involvement and spanking behaviors. Parental involvement is measured by eight items regarding the parenting behaviors in the Index of Child Care Environment (ICCE), which has been published in both Japanese and Chinese and is widely used in practice in the two countries (Anme, Shinohara, et al., 2013; Anme, Tanaka, et al., 2013; Li et al., 2021; Child Care Power-up Group n.d.). The eight questions are about the frequency of (1) playing with the child, (2) shopping with the child, (3) reading to the child, (4) singing songs with the child, (5) going to the park with the child, (6) taking the child to meet with friends or relatives with children of a similar age, (7) eating meals together with the child, and (8) talking about the child with family members. Answers for the items are categorized as "Non-involvement group (response as rarely)" and "Involvement group (response as 1–3 times/month, 1–2 times/week, 3–4 times/week, and almost every day)." Higher numbers of items in the "Involvement group" refers to more parental involvements, which ranges from 0 to 8.

Spanking is a commonly used physical punishment at home and was determined by one item in the self-report questionnaire for parents in the study: "How many times did you spank your child in the past week?" Five options were given: none, 1–2 times, 3–4 times, 5–6 times, or 7 times and over. "None" was classified as the no-spanking group and coded as 1; all other responses were classified as the spanking group and coded as 0.

Demographic Characteristics

Previous studies have demonstrated that demographics are critical to the development of children's social skills (Arace et al. 2019). Demographic information was reported by parents including age (continuous variables), gender (boys = 0, girls = 1), family structure (nuclear family = 0, extended family = 1), and siblings (no siblings = 0, having siblings = 1).

Data Analysis

All analyses were conducted using Mplus (Version 8.3; Muthén and Muthén, Los Angeles, CA, USA) and SPSS (Version 26.0; SPSS Inc., Chicago, IL, USA).

First, we used descriptive statistics to confirm demographic background, parental involvement, and spanking conditions in the entire sample, the Japanese sample, and the Chinese sample. The Mann–Whitney U test and Chisquare test were used to analyze the differences between the Japanese and Chinese samples.

Second, the validity and reliability of the SSS in the Japanese and Chinese samples were tested. A confirmatory factor

analysis (CFA) was applied to determine the construct validity of the SSS in the two samples. The comparative fit index (CFI), Tucker–Lewis index (TLI), and root mean square error of approximation (RMSEA) were used to evaluate CFA models (Xia & Yang, 2019). In addition, composite reliability showing the "omega" coefficient was calculated in the current study instead of using the coefficient alpha, which is more suitable for ordinal variables (Raykov et al., 2010).

Third, the measurement invariance of the first-order and second-order factors for SSS were tested following the four steps established by Vandenberg and Lance (2000). Configural invariance was first tested by setting factor loadings, intercepts of variables, and residual variances as free parameters. Second, we examined the metric invariance, which refers to constraints of equivalent factor loadings and the release of intercepts and residual variances. Third, we constrained the factor loadings and intercepts so that they were equal across groups to test scalar invariance. Finally, the strict or residual invariance was tested by constraining factor loadings, intercepts of variables, and residual variances, which were all set to be equal across groups. As for the model comparison, changes in RMSEA (ΔRMSEA), CFI (ΔCFI), TLI (ΔTLI), and χ^2 ($\Delta\chi^2$) are commonly used to compare the nested models, and they would be acceptable if ΔRMSEA $\leq$ |0.015|, ΔCFI $\leq$ |0.01|, ΔTLI $\leq$ |0.01| and $\Delta\chi^2$/Δdf < |5| (Chen et al., 2021; Sass et al., 2014).
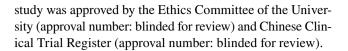
The second-order factor model would be further tested only if metric invariance was passed in the first-order factor model. The testing steps and evaluation standards were all the same as they were in the first-order factor model.

The Monte Carlo approach was used to test the statistical power of CFA results under the accepted measurement invariance model. Sample size, factor overdetermination, factor correlation equality, and item communality were considered in the power analysis. The Monte Carlo simulation estimates the proportion of generated samples where the null hypothesis is correctly rejected (Kyriazos, 2018). The criteria suggested by Muthén and Muthén (2002) are (1) parameter and standard error bias < 10% for each model parameter; (2) standard errors bias < 5% for parameters that the power analysis targets, and (3) coverage ranging from 0.91 to 0.98.

Finally, Spearman correlation analysis was used to test correlations among all variables in the final regression model. The adjusted Tobit regression model was then applied to confirm the factors related to social skill scores, especially the country effects (McBee, 2010).

Ethical Approval

All the parents whose children participated in the study provided written informed consent after being fully informed of the entire process and their rights during the study. The

study was approved by the Ethics Committee of the University (approval number: blinded for review) and Chinese Clinical Trial Register (approval number: blinded for review).

Results

Descriptive statistics are summarized in Table 1. In the demographic background of the Japanese and Chinese samples, no significant difference in sex ratio was found ($\chi^2 = 0.345$, $p = 0.557$). The number of parental involvement activities in the two samples also showed no significant difference (Z = -0.532; p = 0.595), while more parents in China (30%) spanked their children than in Japan (20%), with a significant difference in statistics ($\chi^2 = 12.979$, $p = 0.000$).

Table 2 shows standardized factor loadings in CFA models of the SSS in the Japanese and Chinese samples. Model fitting was good in the two samples: df = 249, $\chi^2 = 530.227$, RMSEA = 0.035 (90%CI: 0.031–0.039), CFI = 0.981, TLI = 0.979 in the Japanese sample, df = 249, $\chi^2 = 565.445$, RMSEA = 0.034 (90%CI: 0.030–0.037), CFI = 0.973, TLI = 0.971 in the Chinese sample.

Table 3 shows the composite reliability of the SSS in the Japanese and Chinese samples. All omega coefficients calculated in both the Japanese and Chinese samples were over 0.950.

The results of the measurement invariance models for the SSS are presented in Table 4. In the first-order factor measurement invariance model, all indices presented good fits to the data in the configural model (RMSEA = 0.032, CFI = 0.979, TLI = 0.977). No significant difference was found between the configural and metric models (ΔRMSEA = 0.001, ΔCFI = -0.001, ΔTLI = -0.000, $\Delta\chi^2$/Δdf = 1.754). The scalar invariance model also showed no significant difference from the metric model (ΔRMSEA = 0.001, ΔCFI = -0.002, ΔTLI = -0.001, $\Delta\chi^2$/Δdf = 3.332). However, the strict invariance was not supported as a significant difference was found compared with the scalar model (ΔRMSEA = 0.002, ΔCFI = -0.004, ΔTLI = -0.004, $\Delta\chi^2$/Δdf = 40.712).

In the second-order factor measurement invariance model, all indices presented good fits to the data in the configural model (RMSEA = 0.034, CFI = 0.978, TLI = 0.976). The results also supported the metric invariance because no significant difference was found between the configural and metric models (ΔRMSEA = 0.002, ΔCFI = -0.002, ΔTLI = -0.001, $\Delta\chi^2$/Δdf = 3.302). However, the scalar invariance was not fully supported as a significant difference was found compared to the metric model (ΔRMSEA = 0.003, ΔCFI = -0.005, ΔTLI = -0.005, $\Delta\chi^2$/Δdf = 7.775).

Therefore, the scalar invariance of the first-order factor model for the SSS was accepted and used in the following analysis. Monte Carlo simulation estimated that 95% coverage of the statistic power was 0.940 in the Japanese

Table 1 Standardized factor loadings for the SSS in CFA models

Variable	Categories	Total (N=2061)		Japan (N=931)		China (N=1130)		Z/χ²	P
		n	%	n	%	n	%		
Age [a]		4.42±1.03		4.35±1.07		4.47±1.00		-2.701	0.007
Gender	Boy	1090	52.9	499	53.6	591	52.3	0.345	0.557
	Girl	971	47.1	432	46.4	539	47.7		
Family Structure	Nuclear	1490	72.3	840	90.2	650	57.5	272.6	0.000
	Extended	571	27.7	91	9.8	480	42.5		
Siblings	Only child	799	38.8	317	34.0	482	42.7	15.92	0.000
	Having siblings	1262	61.2	614	66.0	648	57.3		
Spanking	No	1519	70.0	722	80.0	797	70.0	12.98	0.000
	Yes	542	30.0	209	20.0	333	30.0		
Parental involvement [b]		7.17±1.12		7.23±0.96		7.11±1.23		-0.532	0.595

[a] refers to the mean age and standard deviation, and the unit is year

[b] refers to mean and standard deviation of the number of parental involvement activities

Table 2 Standardized factor loadings for the SSS in CFA models

Item		Factor loading	
		Japan	China
Subdomain1: Assertion			
1	Initiates eye contact	0.947	0.858
2	Displays strong reactions	0.951	0.873
3	Displays happiness	0.666	0.865
4	Shows feelings through facial expressions	0.737	0.789
5	Expresses appropriate greetings to others	0.825	0.873
6	Initiates talk with another person	0.850	0.884
7	Makes eye contact when speaking with others	0.928	0.900
8	Participates in companies when asked	0.734	0.925
9	Does not throw tantrums in public	0.849	0.774
10	Waits patiently	0.958	0.830
11	Shares toys or food with others	0.859	0.866
12	Does not interrupt another's speech	0.899	0.859
13	Waits their turn	0.953	0.962
14	Borrows toys from others	0.797	0.848
15	Behaves well as required by the situation	0.915	0.804
16	Postpones gratification when requested	0.908	0.779
Subdomain3: Cooperation			
17	Helps friends when friends get hurt	0.909	0.881
18	Brings cheer to friends who look lonely	0.959	0.949
19	Cheers up and comforts a person who fails	0.943	0.928
20	Happy when friends succeed	0.856	0.873
21	Praises friend's success	0.931	0.973
22	Congratulates a friend who has done well	0.925	0.968
23	Helps friends when asked	0.923	0.772
24	Helps friends without having to be asked	0.861	0.938

All loadings were significant at $p < 0.001$

Table 3 Omega coefficients showing composite reliability of the SSS

Country	Assertion score	Self-control score	Cooperation score	Total score
Japan	0.959	0.969	0.977	0.982
China	0.962	0.953	0.973	0.982

sample and 0.945 in the Chinese sample (Monte Carlo model fit in the Japanese sample: χ^2: 249.527±22.375, AIC: 75,525.019±310.909, aBIC: 75,709.059±310.909, RMSEA: 0.003±0.003, SRMR: 0.008±0.001; Monte Carlo model fit in the Chinese sample: χ^2: 249.520±22.401, AIC: 71,084.271±310.937, aBIC: 71,268.310±310.937, RMSEA: 0.003±0.003, SRMR: 0.006±0.001).

Table 5 shows Spearman's rank correlation coefficients of binary correlations among all variables in the entire sample. The country was significantly related to assertion and cooperation subdomain scores, without significant relationships with self-control subdomain scores (Assertion subdomain: $r_s = 0.13$, $p < 0.01$; cooperation subdomain: $r_s = -0.15$, $p < 0.01$).

Table 6 presents the results of the Tobit regression analysis, showing the factors related to social skills and the moderating effects of country. In model 1, age and gender were associated with all the SSS subdomains, while spanking behavior was only associated with the self-control subdomain after controlling for country effects (Estimate=0.078, S.E.=0.028). After adjusting for children's age, gender, having siblings or not, family structure, spanking behavior, and parental involvement, model 2 showed that, compared to the Chinese sample, cooperation skills significantly increased more with age in the Japanese sample (Estimate=0.753, S.E.=0.146). Models 3 and 4 showed that country did not moderate the associations between gender, spanking behavior, and all subdomains of social skills.

Table 4 Measurement invariance for the SSS across Japanese and Chinese samples

Model	χ^2	df	RMSEA	CFI	TLI	$\Delta\chi^2/(\Delta df)$	ΔRMSEA	ΔCFI	ΔTLI
First-order factor model									
Configural	1059.004***	498	0.033	0.979	0.977	/	/	/	/
Metric	1095.839***	519	0.033	0.978	0.977	1.754	0.000	-0.001	-0.000
Scalar	1165.805***	540	0.034	0.976	0.976	3.332	0.001	-0.002	-0.001
Strict	1287.942***	543	0.036	0.972	0.971	40.712	0.002	-0.004	-0.005
Second-order factor model									
Configural	1087.456***	501	0.034	0.978	0.976	/	/	/	
Metric	1163.407***	524	0.034	0.976	0.975	3.302	0.000	-0.002	-0.001
Scalar	1326.677***	545	0.037	0.971	0.970	7.775	0.003	-0.005	-0.005

Table 5 Binary correlations among all variables in the entire sample

Variables	1	2	3	4	5	6	7	8	9	10
1 Age	1									
2 Gender	0.03	1								
3 Sibling	0.02	0.02	1							
4 Family structure	0.01	-0.01	-0.02	1						
5 Spanking	0.05*	0.10**	-0.01	-0.04	1					
6 Parental involvement	-0.064**	0.03	-0.07**	-0.02	0.02	1				
7 Country	-0.06**	-0.01	0.09**	-0.36**	0.08**	0.01	1			
8 Assertion	0.13**	0.09**	-0.01	-0.05*	0.07**	0.01	0.13**	1		
9 Self-control	0.21**	0.13**	0.05*	-0.02	008**	-0.04	-0.01	0.46**	1	
10 Cooperation	0.41**	0.16**	0.03	0.05*	0.05*	-0.01	-0.15**	0.37**	0.52**	1

Numbers in the table show the Spearman correlation coefficients. *: $p < 0.05$, **: $p < 0.01$

Discussion

Child social skills development is an increasingly international field. However, it has long been dominated by English-speaking countries, with disproportionate representation of research participants from relatively advantaged Western cultural backgrounds. This study used Japanese and Chinese samples to examine the measurement invariance and country differences of child social skills development in an Asian context. Our first hypothesis regarding measurement invariance was partially supported by the finding that configural, metric, and scalar invariance for the first-order factor of the SSS was proved across the Japanese and Chinese samples. Our second hypothesis regarding country difference was also partially supported by the finding that, compared to the Chinese sample, cooperation skills increased more with age in the Japanese sample, while the negative effects of spanking showed no significant difference between the two countries.

Regarding the cultural adaptations of the psychometric measurements, two major questions addressed in the existing research are: (1) differential item functioning (DIF), which mainly tests whether responses to the same items differ between multicultural groups (Lin et al., 2018); (2) degrees of measurement invariance, which mainly test whether a measuring instrument is valid for studying different populations (Kim & Yoon, 2011). Several studies have highlighted the cultural specificity of social behavior, such as cultural differences in eye contact, facial expressions and recognition, behavioral interactions, and so on (Harrison et al., 2017). Different expression forms for the same social behavior might be assessed as different results, and this needs to be adjusted in various cultures. For example, an observational experiment regarding emotion expressing on receiving an undesired gift showed that Chinese preschool children displayed more positive expressions than did Japanese children in the disappointment (Ip et al., 2021). However, a study of 4856 first-grade students, including African American, Hispanic/Latino, and Caucasian students, indicated that, even though items from the Emotional and Behavioral Screener (EBS) exhibited significant DIF, the limited DIF did not significantly impact overall scores, meaning that EBS could be used with measurement invariance across race and ethnicity groups (Lambert et al., 2018). Therefore, even though DIF might always be an issue when assessing social skills across cultures, finding a valid scale with measurement invariance used in multicultural contexts is beneficial for comparison studies in the field.

Table 6 Related factors of social skills and moderating effects of country

Variables	Assertion		Self-control		Cooperation	
	Estimate	S.E	Estimate	S.E	Estimate	S.E
Model 1						
Age	0.241**	0.043	0.303**	0.030	0.493**	0.024
Gender	0.149**	0.039	0.166**	0.029	0.176**	0.024
Sibling	-0.036	0.039	0.048	0.029	0.026	0.024
Family structure	0.014	0.037	-0.010	0.031	0.012	0.026
Spanking	0.050	0.035	0.078**	0.028	0.031	0.023
Parental involvement	0.030	0.036	-0.039	0.031	0.038	0.025
Country	0.286**	0.040	0.002	0.032	-0.126**	0.026
Model 2						
Age * Country	0.146	0.249	0.295	0.167	0.753**	0.146
Model 3						
Gender* Country	0.060	0.182	0.189	0.128	0.038	0.104
Model 4						
Spanking * Country	-0.154	0.143	-0.046	0.102	-0.112	0.082

1. Reference group: Gender = boy; Sibling = Only child; Family structure = nuclear family; Spanking = spanking group; Country = China. Age and parental involvement were regarded as continuous variables

2. Assertion, self-control, and cooperation were the dependent variables. The independent variables in Model 1 were age, gender, sibling, family structure, spanking, and parental involvement. Models 2, 3, and 4 tested the moderating effects of country and all adjusted for age, gender, having siblings or not, family structure, spanking, and parental involvement

3. The table shows completely standardized results of Tobit regression models. *: $p < 0.05$, **: $p < 0.01$

To the best of our knowledge, this is the first study to test measurement invariance for a social skill assessment across different Asian samples. Our results support the scalar invariance of the SSS across Japanese and Chinese samples, which means that the magnitudes of the relationships between items and the latent factors, as well as the thresholds of items, are equivalent across Japan and China. The strict invariance of the SSS was not supported in the current study, which means that the error variance could not be set as equal across the two country samples. Error variance might be considered the variance of item reliabilities across groups. However, the SSS presented good composite reliability in the current study, with all omega coefficients over 0.950. Therefore, as Vandenberg and Lance (2000) have argued that comparisons of latent factors could be conducted with confidence if scalar invariance is supported, the SSS could be used as an effective assessment of social skills in both Japan and China. Notably, the scalar invariance test was not supported by the second-factor model of the SSS, which refers to social skills being assessed by three subdomains (assertion, self-control, and cooperation) instead of combining them into a second-order latent factor. In our framework, assertion, self-control, and cooperation, respectively, refer to behaviors that initiate social interactions or express opinions, hold back impulsive emotions/ideas/actions, and coordinate or collaborate with others (Gresham, 2001). In the existing researches, another scale, named the Interaction Rating

Scale (IRS) and its Chinese version (IRS-C), have also been used to observe parent–child interactions and evaluate children's social skills in both Japan and China (Anme et al., 2010; Huang et al., 2022; Sugisawa et al., 2010), in which key concepts in subdomains are consistent with the descriptions of assertion, self-control, and cooperation in the SSS. Moreover, previous studies also demonstrated that assertion, self-control, and cooperation are related to each other and have long-term effects on child social development (Dunfield et al., 2011; Gülseven et al., 2021). These additional evidences about the validity of the first-order factor structure for the SSS from previous studies support our findings in the current study. Besides, our findings further suggest that the SSS could be used as an equative measurement to evaluate child social skills across Japan and China.

After confirming the measurement invariance of the SSS, the diversity of child social skills development in Asian countries was discussed by comparing Japanese and Chinses samples. We indicated that, compared to the Chinese sample, cooperation skills increase more with age in the Japanese sample. Previous studies also have demonstrated that age is related to the child social skills developmental trajectory (Spence, 2014; Takahashi et al., 2015). Especially for cooperation development, different cooperation skills mainly develop during different age stages, from helping behaviors in toddlerhood to less antagonistic behaviors at the end of preschool age (Slocombe & Seed, 2019; Endedijk et al.,

2020). However, country differences on the associations between age and child social skills development are firstly detected in the current study and we discussed entrance age to nurseries or kindergartens might be one possible reason for the difference. Linberg et al. (2020) indicated that preschoolers with prior childcare experience are more involved with their peers and more cooperative than are those without early exposure to collective childcare activities. There is a large difference in entrance age between Japan and China: 22.5% of Japanese children under three years old attended nurseries, while only 4% of children under three were enrolled in nurseries in China (Jay, 2010; OECD, 2016). The difference in entrance ages across Japan and China could account for the changes in the cooperation skill trajectory.

In contrast to country differences on child social skills development, we found that spanking is negatively associated with self-control without significant country difference. Spanking is one of the most common types of parental discipline around the world (UNICEF, 2017). In the current study, 20% of Japanese parents had spanked their children in the previous week while that proportion in China was 30%. Existing researches have explored cultural reasons for the spread of corporal punishment. In Japan, mothers' unstable work status, such as part-time employment and unemployment, were risk factors for spanking after adjusting for socioeconomic factors (Baba et al., 2020). In China, parents tend to perceive harsh parenting behaviors with a common value that "Beating and scolding are symbols of love" (Hou et al., 2011). However, we found that spanking is negatively related to children's self-control skills across Japanese and Chinese samples and that the moderating effects of culture are not significant in these associations. Our findings are consistent with the results of hundreds of previous studies showing no beneficial effect of corporal punishment on children (Heilmann et al., 2021). For example, spanked children have been proven to develop low self-control skills, more external aggression or antisocial behaviors, and impaired mental health problems in Western countries (Bunting et al., 2018). Our results supplement evidence from Eastern cultures supporting the ban on corporal punishment, including spanking.

Limitations and Future Directions

This study has several limitations that should be considered when interpreting the results and designing future studies. First, although the current study was based on relatively large samples in both Japan and China, the results cannot be generalized to the entire countries without further evidence. Representativeness of samples should be confirmed by collecting more demographic information in further research. Second, because of the influence of COVID-19, investigations in the two countries were not conducted in the same year, likely leading to some uncontrollable influence on the results. To confirm our results, further surveys in both countries should be conducted at the same time after the pandemic ends. Third, even though teachers who evaluated child social skills in the current study had been well trained on the identical manuals, Japanese and Chinese teachers might interpret observed behaviors differently because of the cultural differences. Recent studies have discussed country difference on teachers' perspectives and the evaluations of child social skills in the evaluation process (Major et al., 2021; Pirskanen et al., 2019). More surveys regarding Japanese and Chinese teachers' perspectives of child social behaviors should be included in future research. Fourth, to increase the comparability of the two country samples, we included parenting practices in our analysis model and controlled for the quality of participating kindergarten based on the national standard. However, childcare quality in kindergartens is another critical factor in preschoolers' social skills development (Baker et al., 2019; Wu et al., 2018). If information regarding the quality of kindergartens could be included in the future, multilevel structural equation models with hierarchical approaches could be used to detect country differences regarding child social skills development not only at the individual level but also at the level of childcare centers or kindergartens. Finally, the current study was designed as a cross-sectional study, so the causal relationship could not be confirmed. Longitudinal studies are required in the future.

Strengths and Practical Implications

Several strengths of the present study deserve to be highlighted. First, as non-English speaking populations in the Asian context have been relatively less examined in multicultural studies, the specific use of Japanese and Chinese samples represents an innovation of the present investigation. Second, we collected data from relatively large samples in both Japan and China, which strengthens the evidence of our discussion on country differences. Third, in addition to multiple CFA models to test measurement invariance, we also used Monte Carlo simulation to confirm the statistical power of our results.

The current cross-cultural research has implications in clinical practice not only for teachers and parents but also for school psychologists and policy makers. As exchanges in the preschool care and education field have been increasing between Japan and China, understanding country differences helps Chinese teachers to adopt successful Japanese experiences of developing child social skills into the Chinese preschool context rather than fully accepting them. We strongly propose that corporal punishments, including spanking, be removed from parenting practices based on evidence across Japan and China, even though spanking is a commonly used physical discipline

in Chinese culture. To manage or prevent difficulties in child social skills development, school psychologists and policy makers should develop intervention approaches considering both universal methods and culture-specific characteristics. They could use the SSS, the measurement invariance of which was proved in the current study, to make further comparisons and gain a better understanding of the diversity in the child social skill development field, contributing to the planning and implementation of interventions in practice.

Conclusions

Our study demonstrates that the SSS is an effective measure for comparing social skills between Japanese and Chinese preschool children. Child social skills development demonstrates the diversities in the Asian context. However, spanking is negatively related to children's self-control performance regardless of country. Discussions about measurement invariance and country differences have increased the perspectives on child social skills development in a multicultural context.

Data Availability The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available because of privacy or ethical restrictions.

Declarations

Ethics Approval Statement The Japanese survey was approved by the Ethics Committee of the University of Tsukuba (approval number: 1657). The Chinese survey was approved by the Chinese Clinical Trial Register (approval number: ChiCTR2100050033).

Conflict of Interest The contributing authors have no potential conflict of interest.

Copyrighted Materials No copyrighted materials have been used in the manuscript.

References

Aguiar, A. L., Aguiar, C., Cadima, J., Correia, N., & Fialho, M. (2019). Classroom quality and children's social skills and problem behaviors: Dosage and disability status as moderators. *Early Childhood Research Quarterly, 49*, 81–92. https://doi.org/10.1016/j.ecresq.2019.05.005

Anme, T., Tanaka, E., Watanabe, T., Tomisaki, E., Mochizuki, Y., & Tokutake, K. (2013). Validity and reliability of the Index of Child Care Environment (ICCE). *Frontiers in Public Health, 2*, 141–145.

Anme, T., Shinohara, R., Sugisawa, Y., Tong, L., Tanaka, E., Watanabe, T., Onda, Y., Kawashima, Y., Hirano, M., Tomisaki, E., Mochizuki, Y., Morita, K., Gan-Yadam, A., Yato, Y., Yamakawa, N., & Japan Children's Study Group. (2010). Interaction Rating Scale (IRS) as an evidence-based practical index of children's social skills and parenting. *Journal of Epidemiology, 20*, Suppl 2 (Supplement_II), S419–S426. https://doi.org/10.2188/jea.JE20090171

Anme, T., Shinohara, R., Sugisawa, Y., Tanaka, E., Watanabe, T., & Hoshino, T. (2013a). Validity and reliability of the Social Skill Scale (SSS) as an index of social competence for preschool children. *Journal of Health Sciences*, *3*(1), 5–11, Retrieved from http://article.sapub.org/10.5923.j.health.2013a0301.02.html

Arace, A., Scarzello, D., Zonca, P., & Agostini, P. (2021). Early child care experiences and individual differences: The role of gender and temperament in social skills and problem behaviours in Italian toddlers. *Early Child Development and Care, 191*(6), 977–989. https://doi.org/10.1080/03004430.2019.1655736

Baba, S., Eshak, E. S., Shirai, K., Fujiwara, T., Yamaoka, Y., & Iso, H. (2020). Factors Associated With Family Member's Spanking of 3.5-year-old Children in Japan. *Journal of Epidemiology, 30*(10), 464–473. https://doi.org/10.2188/jea.JE20190160

Baker, M., Gruber, J., & Milligan, K. (2019). The long-run impacts of a universal child care program. *American Economic Journal: Economic Policy, 11*(3), 1–26. https://doi.org/10.1257/pol.20170603

Berk, L. E. (2000). *Child development* (fifth edn.). Boston: Allyn & Bacon, (pp. 23–38)

Bunting, L., Webb, M. A., & Healy, J. (2018). The "smacking Debate". In *Northern Ireland: Messages from research. Northan Ireland commissioner for children and young people*, Retrieved from https://dera.ioe.ac.uk/11059/1/SmackingDebateNISummary_wdf63282.pdf.

Chang, L., Mak, M. C. K., Li, T., Wu, B. P., Chen, B. B., & Lu, H. J. (2011). Cultural adaptations to environmental variability: An evolutionary account of East-West differences. *Educational Psychology Review, 23*(1), 99–129. https://doi.org/10.1007/s10648-010-9149-0

Chen, W., Zhang, G., Tian, X., & Wang, L. (2021). Psychometric properties and measurement invariance of the emotion regulation questionnaire in Chinese left-behind children. *Current Psychology*. https://doi.org/10.1007/s12144-021-02155-y

Cheung, P. P., Siu, A. M., & Brown, T. (2017). Measuring social skills of children and adolescents in a Chinese population: Preliminary evidence on the reliability and validity of the translated Chinese version of the Social Skills Improvement System-Rating Scales (SSIS-RS-C). *Research in Developmental Disabilities, 60*, 187–197. https://doi.org/10.1016/j.ridd.2016.11.019

Child care power-up group (n.d.). *eTools,* Retrieved from childnet.me, Retrieved from http://childnet.me/etools.html

Dunfield, K., Kuhlmeier, V. A., O'Connell, L., & Kelley, E. (2011). Examining the diversity of prosocial behavior: Helping, sharing, and comforting in infancy. *Infancy: the Official Journal of the International Society on Infant Studies*, *16*(3), 227–247. https://doi.org/10.1111/j.1532-7078.2010.00041.x

Endedijk, H. M., Cillessen, A. H. N., Bekkering, H., & Hunnius, S. (2020). Cooperation and preference by peers in early childhood: A longitudinal study. *Social Development, 29*(3), 854–870. https://doi.org/10.1111/sode.12437

Eslami, A. A., Amidi Mazaheri, M. A., Mostafavi, F., Abbasi, M. H., & Noroozi, E. (2014). Farsi version of social skills rating system-secondary student form: Cultural adaptation, reliability and construct validity. *Iranian Journal of Psychiatry and Behavioral Sciences, 8*(2), 97–104.

Freitas, C. L., & Del Prette, Z. A. P., (2015). Social skills rating system - Brazilian version: New exploratory and confirmatory factorial analyses. *Avances en Psicología Latinoamericana, 33*(1), 135–156. https://doi.org/10.12804/apl33.01.2015.10

Frey, J. R., Elliott, S. N., & Gresham, F. M. (2011). Preschoolers' social skills: Advances in assessment for intervention using social behavior ratings. *School Mental Health, 3*(4), 179–190. https://doi.org/10.1007/s12310-011-9060-y

Gamst-Klaussen, T., Rasmussen, L.-M.P., Svartdal, F., & Strømgren, B. (2016). Comparability of the social skills improvement system to the social skills rating system: A Norwegian study. *Scandinavian Journal of Educational Research, 60*(1), 20–31. https://doi.org/10.1080/00313831.2014.971864

Gresham, F. M. (2016). Social skills assessment and intervention for children and youth. *Cambridge Journal of Education, 46*(3), 319–332. https://doi.org/10.1080/0305764X.2016.1195788

Gresham, F. M., & Elliott, S. N. (1984). Assessment and classification of children's social skills: A review of methods and issues. *School Psychology Review, 13*(3), 292–301.

Gresham, F. M., & Elliott, S. N. (1990). *Social skills rating system*. Minneapolis, MN: Pearson Assessments

Gresham, F. M. (2001). *Assessment of social skills in children and adolescents. Handbook of psychoeducational assessment: A practical handbook*, (pp. 325–355)

Gülseven, Z., Liu, Y., Ma, T. L., Yu, M. V. B., Simpkins, S. D., Vandell, D. L., & Zarrett, N. (2021). The development of cooperation and self-control in middle childhood: Associations with earlier maternal and paternal parenting. *Developmental Psychology, 57*(3), 397–409. https://doi.org/10.1037/dev0001151

Guo, K., & Zhong, Y. (2019). Children's learning in Japan and China: A comparative study of preschool parents' perspectives. *Issues in Educational Research, 29*(4), 1160–1180.

Harrison, A. J., Long, K. A., Tommet, D. C., & Jones, R. N. (2017). Examining the role of race, ethnicity, and gender on social and behavioral ratings within the autism diagnostic observation schedule. *Journal of Autism and Developmental Disorders, 47*(9), 2770–2782. https://doi.org/10.1007/s10803-017-3176-3

Heilmann, A., Mehay, A., Watt, R. G., Kelly, Y., Durrant, J. E., van Turnhout, J., & Gershoff, E. T. (2021). Physical punishment and child outcomes: A narrative review of prospective studies. *The Lancet, 398*(10297), 355–364. https://doi.org/10.1016/S0140-6736(21)00582-1

Hosokawa, R., & Katsura, T. (2017). Marital relationship, parenting practices, and social skills development in preschool children. *Child and Adolescent Psychiatry and Mental Health, 11*(1), 2. https://doi.org/10.1186/s13034-016-0139-y

Hou, J., Yu, L., Ting, S. R., Sze, Y. T., & Fang, X. (2011). The status and characteristics of couple violence in China. *Journal of Family Violence, 26*(2), 81–92. https://doi.org/10.1007/s10896-010-9343-3

Hu, B. Y., Fan, X., Wu, Z., LoCasale-Crouch, J., Yang, N., & Zhang, J. (2017). Teacher-child interactions and children's cognitive and social skills in Chinese preschool classrooms. *Children and Youth Services Review, 79*, 78–86. https://doi.org/10.1016/j.childyouth.2017.05.028

Huang, Y., Yan, Q., & Tong, L. (2022). Reliability and validity of an observation-based parent–child interaction rating scale for Chinese children aged 0–6 years. *Psychological Assessment*. https://doi.org/10.1037/pas0001121

Ip, K. I., Miller, A. L., Karasawa, M., Hirabayashi, H., Kazama, M., Wang, L., Olson, S. L., Kessler, D., & Tardif, T. (2021). Emotion expression and regulation in three cultures: Chinese, Japanese, and American preschoolers' reactions to disappointment. *Journal of Experimental Child Psychology, 201*, 104972. https://doi.org/10.1016/j.jecp.2020.104972

Irwin, H. (2020). *Communicating with Asia: Understanding people and customs*. Routledge

Jay, A. (2010). Cultural differences: Their effect on social skill development, Retrieved from https://digitalcommons.providence.edu/socialwrk_students/62/

Jing, Z. (2019). A Comparative study on the Construction of Public Service system of 6-year-old Integration of childcare and education Preschool Education in OECD. *Frontiers in Educational Research*, *2*(9)

Khandaker, R. (2021). Professional Training: Crucial Need to Enhance the Efficacy of Preschool Teachers in the Context of Bangladesh. *Oalib, 08*(9), 1–23. https://doi.org/10.4236/oalib.1107880

Kim, E. S., & Yoon, M. (2011). Testing measurement invariance: A comparison of multiple-group categorical CFA and IRT. *Structural Equation Modeling: A Multidisciplinary Journal, 18*(2), 212–228. https://doi.org/10.1080/10705511.2011.557337

Kyriazos, T. A. (2018). Applied psychometrics: Sample size and sample power considerations in factor analysis (EFA, CFA) and SEM in General. *Psychology, 09*(8), 2207–2230. https://doi.org/10.4236/psych.2018.98126

Lambert, M. C., January, S. A., Cress, C. J., Epstein, M. H., & Cullinan, D. (2018). Differential item functioning across race and ethnicity for the Emotional and Behavioral Screener. *School Psychology Quarterly: THe Official Journal of the Division of School Psychology, American Psychological Association, 33*(3), 399–407. https://doi.org/10.1037/spq0000224

Lansford, J. E., Godwin, J., Bornstein, M. H., Chang, L., Deater-Deckard, K., Di Giunta, L., Dodge, K. A., Malone, P. S., Oburu, P., Pastorelli, C., Skinner, A. T., Sorbring, E., Steinberg, L., Tapanya, S., Uribe Tirado, L. M. U., Alampay, L. P., Al-Hassan, S. M., & Bacchini, D. (2018). Parenting, culture, and the development of externalizing behaviors from age 7 to 14 in nine countries. *Development and Psychopathology, 30*(5), 1937–1958. https://doi.org/10.1017/S0954579418000925

Lerner, R. M., Liben, L. S., & Mueller, U. (2015). *Handbook of child psychology and developmental science, cognitive processes* (pp.15–16). John Wiley & Sons

Li, X., Jiao, D., Matsumoto, M., Zhu, Y., Zhang, J., Zhu, Z., Liu, Y., Cui, M., Wang, Y., Qian, M., Ajmal, A., Afsari Banu, A., Graça, Y., Tanaka, E., Watanabe, T., Sawada, Y., Tomisaki, E., & Anme, T. (2021). Home environment and social skills of Japanese preschool children pre- and post-COVID-19. *Early Child Development and Care, 1–12*,. https://doi.org/10.1080/03004430.2021.2021896

Lin, C. Y., Griffiths, M. D., & Pakpour, A. H. (2018). Psychometric evaluation of Persian Nomophobia Questionnaire: Differential item functioning and measurement invariance across gender. *Journal of Behavioral Addictions, 7*(1), 100–108. https://doi.org/10.1556/2006.7.2018.11

Linberg, A., Lehrl, S., & Weinert, S. (2020). The early years home learning environment - Associations with parent–child-course attendance and children's vocabulary at age 3. *Frontiers in Psychology, 11*, 1425. https://doi.org/10.3389/fpsyg.2020.01425

Major, S., & Seabra-Santos, M. J. (2014). Factor validation of the Portuguese version of the social skills scale of the preschool and kindergarten behavior scales. *Paidéia, 24*(58), 145–154. https://doi.org/10.1590/1982-43272458201402

Major, S. O., Seabra-Santos, M. J., Martin, R. P., & Ventura, M. F. (2021). Preschoolers' social skills and behavior problems: A cross-cultural exploratory study of Angolan and Portuguese teachers' perceptions. *Current Psychology*. https://doi.org/10.1007/s12144-021-01375-6

McBee, M. (2010). Modeling outcomes with floor or ceiling effects: An introduction to the Tobit model. *Gifted Child Quarterly, 54*(4), 314–320. https://doi.org/10.1177/0016986210379095

Mulyadi, B. (2020). The Uniqueness of An Early Childhood Education System Japan. *IZUMI, 9*(1), 75–82.

Muthén, L. K., & Muthén, B. O. (2002). How to use a Monte Carlo study to decide on sample size and determine power. *Structural Equation Modeling: A Multidisciplinary Journal, 9*(4), 599–620. https://doi.org/10.1207/S15328007SEM0904_8

OECD. (2016). OECD family database. *The Structures of Families*, Retrieved from https://www.oecd.org/els/social/family/database

Pan, Y., Wang, X., & Li, L. (2018). Early childhood education and development in China. In. *Springer International Handbooks of Education*. Dordrecht: Springer, (599–622). https://doi.org/10.1007/978-94-024-0927-7_28

Peng, L. (2021). The difference of family value between China and America. *Social Sciences, 10*(5). https://doi.org/10.11648/j.ss.20211005.12

Pirskanen, H., Jokinen, K., Karhinen-Soppi, A., Notko, M., Lämsä, T., Otani, M., Meil, G., Romero-Balsas, P., & Rogero-García, J. (2019). Children's emotions in educational settings: Teacher perceptions from Australia, China, Finland, Japan and Spain. *Early Childhood Education Journal, 47*(4), 417–426. https://doi.org/10.1007/s10643-019-00944-6

Raykov, T., Dimitrov, D. M., & Asparouhov, T. (2010). Evaluation of scale reliability with binary measures using latent variable modeling. *Structural Equation Modeling: A Multidisciplinary Journal, 17*(2), 265–279. https://doi.org/10.1080/10705511003659417

Sass, D. A., Schmitt, T. A., & Marsh, H. W. (2014). Evaluating model fit with ordered categorical data within a measurement invariance framework: A comparison of estimators. *Structural Equation Modeling: A Multidisciplinary Journal, 21*(2), 167–180. https://doi.org/10.1080/10705511.2014.882658

Slocombe, K. E., & Seed, A. M. (2019). Cooperation in Children. *Current Biology: CB, 29*(11), R470–R473. https://doi.org/10.1016/j.cub.2019.01.066

Spence, S. H. (2014). Developments in the assessment of social skills and social competence in children. *Behaviour Change, 8*(4), 148–166. https://doi.org/10.1017/S081348390000663X

Sugisawa, Y., Shinohara, R., Tong, L., Tanaka, E., Yato, Y., Yamakawa, N., Anme T., & Japan Children's Study Group. (2010). Reliability and validity of Interaction Rating Scale as an index of social competence. *Japanese Journal of Human Sciences of Health-Social Services, 16*(1), 43–55

Takahashi, Y., Okada, K., Hoshino, T., & Anme, T. (2008). Social skills of preschoolers. *Japanese Journal of Educational Psychology, 56*(1), 81–92. https://doi.org/10.5926/jjep1953.56.1_81

Takahashi, Y., Okada, K., Hoshino, T., & Anme, T. (2015). Developmental trajectories of social skills during early childhood and links to parenting practices in a Japanese sample. *PLoS ONE, 10*(8), e0135357. https://doi.org/10.1371/journal.pone.0135357

UNICEF (2017). *A familiar face: Violence in the lives of children and adolescents* Retrieved from: https://data.unicef.org/wp-content/uploads/2017/10/EVACBooklet-FINAL-10_31_17-high-res.pdf

Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 3*(1), 4–70. https://doi.org/10.1177/109442810031002

Walthall, J. C., Konold, T. R., & Pianta, R. C. (2005). Factor structure of the social skills rating system across child gender and ethnicity. *Journal of Psychoeducational Assessment, 23*(3), 201–215. https://doi.org/10.1177/073428290502300301

Wu, Z., Hu, B. Y., Fan, X., Zhang, X., & Zhang, J. (2018). The associations between social skills and teacher-child relationships: A longitudinal study among Chinese preschool children. *Children and Youth Services Review, 88*, 582–590. https://doi.org/10.1016/j.childyouth.2018.03.052

Xia, Y., & Yang, Y. (2019). RMSEA, CFI, and TLI in structural equation modeling with ordered categorical data: The story they tell depends on the estimation methods. *Behavior Research Methods, 51*(1), 409–428. https://doi.org/10.3758/s13428-018-1055-2

Zhu, Y. T., Li, X., Jiao, D. D., Tanaka, E., Tomisaki, E., Watanabe, T., Sawada, Y., Zhu, Z., Ajmal, A., Matsumoto, M., & Anme, T. (2021). Development of social skills in kindergarten: A latent class growth modeling approach. *Children, 8*(10). https://doi.org/10.3390/children8100870

Authors and Affiliations

Zhu Zhu[1,2] · Dandan Jiao[1] · Xiang Li[1] · Yantong Zhu[1] · Cunyoen Kim[3] · Ammara Ajmal[4] ·
Munenori Matsumoto[1] · Emiko Tanaka[5] · Etsuko Tomisaki[6] · Taeko Watanabe[7] · Yuko Sawada[8] ·
Tokie Anme[9]

Zhu Zhu
zhuzhu881231@yahoo.co.jp

Dandan Jiao
jdd2013112@gmail.com

Xiang Li
lixiangdufl@gmail.com

Yantong Zhu
zyt199431@gmail.com

Cunyoen Kim
kinnsyuuenn@yahoo.co.jp

Ammara Ajmal
ammara.ajmal6@gmail.com

Munenori Matsumoto
11MN023w9Y-ts@slcn.ac.jp

Emiko Tanaka
warakott@gmail.com

Etsuko Tomisaki
etomi@sfc.keio.ac.jp

Taeko Watanabe
taeko.watanabe@soc.shukutoku.ac.jp

Yuko Sawada
ysawa1110@yahoo.co.jp

[1]   School of Comprehensive Human Science, University
     of Tsukuba, Tsukuba 305-8577, Japan

[2]   Faculty of Preschool and Special Education, Xuzhou
     Kindergarten Teachers College, Xuzhou 221004, China

[3]   School of Education Science, Leshan Normal University,
     Leshan 614000, China

[4]   Department of Anesthesia, Sandeman Provincial Hospital,
     Quetta 87300, Pakistan

[5]   Faculty of Nursing, Musashino University, Tokyo 202-8585,
     Japan

[6]   Faculty of Nursing and Medical Care, Keio University,
     Tokyo 160-8582, Japan

[7]   Faculty of Nursing, Shukutoku University, Chiba 260-8701,
     Japan

[8]   Faculty of Health Medicine, Morinomiya University
     of Medical Sciences, Osaka 559-8611, Japan

[9]   Faculty of Medicine, University of Tsukuba, 1-1-1,
     Tennoudai, Tsukuba, Ibaraki 305-8577, Japan