Original Article

Confirmatory Factor Analysis and Measurement Invariance of the Multidimensional Scale of Perceived Social Support in Young Psychiatric and Non-Psychiatric Asians

Wen Lin Teh, [1]*BSocSci (Hons)*, Shazana Shahwan, [1]*MClinPsych*, Edimansyah Abdin, [1]*PhD*, Yunjue Zhang, [1]*BPsych*, Rajeswari Sambasivam, [1]*BSc*, Fiona Devi, [1]*BA*, Swapna Verma, [2]*MBBS, MD*, Siow Ann Chong, [1]*MBBS, MMed*, Mythily Subramaniam, [1]*MBBS, MHSM*

Abstract

Introduction: Studies of the 3-factor (family, friends and significant others) Multidimensional Scale of Perceived Social Support (MSPSS) have shown mixed results in non-Western and/or psychiatric populations due to factorial inconsistencies in its structure. Our study aimed to replicate and expand previous findings of MSPSS through confirmatory factor analysis (CFA) and measurement invariance analysis in a young Asian population of psychiatric and non-psychiatric subjects. Materials and Methods: Data on 209 subjects were examined. The majority were Chinese (66.5%) followed by Malays (17.2%), Indians (14.4%) and other ethnicities (1.9%). Subjects in the non-psychiatric group (n = 100) did not report any psychiatric illnesses. Subjects in the psychiatric group (n = 109) were outpatients of a tertiary hospital in Singapore who had been diagnosed with depressive disorders. Results: The 3-factor models of MSPSS showed better fit indices than the 2-factor models (friends/significant others and family, or family/significant others and friends) which indicated that the 3-factor structure of MSPSS was valid. Multigroup CFA demonstrated metric invariance, indicating MSPSS scores can be compared across groups. In the psychiatric group, descriptive and weighted univariate analyses revealed significantly lower levels of perceived social support in every domain of MSPSS. Conclusion: The 3-factor model of MSPSS can be used to compare psychiatric and non-psychiatric subjects locally. Since psychiatric patients reported lower MSPSS scores, future research could examine the causative factors that contribute to lower perceived social support in young adults seeking psychiatric intervention.

Ann Acad Med Singapore 2019;48:314–20

Key words: Factorial validity, Multiethnic, Southeast Asia

Introduction

Social support is defined as a social resource that is associated with multiple health outcomes and mortality.[1-7] Poor social support has been shown to correlate with unfavourable social and psychological outcomes such as low life satisfaction and self-esteem and psychological distress such as anxiety and depression.[8–10]

In the last few decades, several qualitative and quantitative scales were developed to measure social support. One of these, the Multidimensional Scale of Perceived Social Support (MSPSS), was a questionnaire developed by Zimet et al[11] to provide quantitative measurement of perceptions of social support from one's family, friends and significant others. Since it comprises only 12 items, the questionnaire is popular among researchers as it is easy and quick to administer and—unlike other similar tools—it also measures perceptions of support in multiple domains.[11]

MSPSS has been validated in adolescent, adult, non-psychiatric and psychiatric populations and in different languages such as Chinese, Malay and Tamil.[11–17] Unfortunately, it is plagued by inconsistencies in factorial validity in psychiatric and/or non-Western populations.[12,18–20]

[1]Research Division, Institute of Mental Health, Singapore
[2]Department of Early Psychosis Intervention, Institute of Mental Health, Singapore
Address for Correspondence: Ms Teh Wen Lin, Research Division, Institute of Mental Health, Buangkok Green Medical Park, 10 Buangkok View, Singapore 539747.
Email: Wen_Lin_Teh@imh.com.sg

For instance, Stanley et al[12] used a 2-factor model of MSPSS—instead of the original 3-factor model introduced by Zimet et al[11]—in their study of older adults who had been diagnosed with general anxiety disorder. In their study, Stanley et al[12] conflated the family and significant others into a single domain. The same methodology was also deployed in a study of non-psychiatric South Asians who lived in Hong Kong.[20] Likewise, Chou[18] employed a 2-factor model of MSPSS in his study of Chinese adolescents. Unlike Stanley et al,[12] however, his findings revealed that his subjects had conflated friends and significant others into 1 domain.[18] A study of Pakistani women had also shown that social support was viewed as a single construct regardless of its source.[19]

On the other hand, findings from the study by Clara et al[21] did not support the 2-factor model of MSPSS. Instead, they reported on the factorial validity of the 3-factor version of MSPSS. The psychiatric subjects in their study also performed worse in all domains of perceived social support. Their results were corroborated by Vaingankar et al[22] who validated the 3-factor MSPSS in a group of adults with schizophrenia from Singapore.

The lack of factorial validity in MSPSS is a major issue. It makes it difficult to compare data on social support—such as between Western and non-Western populations or between psychiatric and non-psychiatric subjects—and to generalise results across different groups. Due to inconsistencies in its factorial validity in non-Western populations, it is not known if MSPSS can be validated in different types of mental illness. There is also a lack of research that compares perceived social support between psychiatric and non-psychiatric residents in Singapore. To the best of our knowledge, previous studies have only examined either healthy non-psychiatric or psychiatric subjects, but not both.[22,23]

Based on results from a study of patients with schizophrenia in Singapore,[22] we hypothesised that the 3-factor models of MSPSS will produce the best fit for data. Our study also investigated whether the factorial structure of MSPSS meets scalar invariance. Finally, we hypothesised that psychiatric subjects would report a lower level of perceived social support from family, friends and significant others than their non-psychiatric counterparts.[8,9,21]

Materials and Methods

A total of 209 subjects were recruited for this study and their sociodemographic details—such as age, education, ethnicity, gender and household income—were collected through their self-report. In the non-psychiatric group, 100 (47.8%) subjects were recruited from the general public using the snowball sampling method. They also reported that they did not suffer from an existing psychiatric condition or illness.

In the psychiatric group (n = 109, 52.2%), only patients who were diagnosed with depressive disorders were included since confirmatory factor analysis (CFA) demands a homogeneous study population. They were also outpatients from the Institute of Mental Health, Singapore. Although a waiver of parental consent was granted for this study, caregivers who accompanied subjects <21 years old were nevertheless informed of the details of the study.

After subjects had provided their written consent to be included in the study, they proceeded to complete the 12-item MSPSS questionnaire. For psychiatric subjects, members of the research team were present to ensure that they did so without any influence from their caregivers. Subjects with intellectual disabilities were excluded from the study. This study was approved by the Domain Specific Review Board of the National Healthcare Group, Singapore.

When grading their response to each item in the MSPSS questionnaire, subjects used a Likert scale that ranged from 1 (very strongly disagree) to 7 (very strongly agree). The mean score of each domain—family, friends and significant others—was tabulated after the total score was divided by 4. Additionally, global perceived social support was derived from the division of the total score by 12.

In this study, we examined 4 models of MSPSS: the original 3-factor model by Zimet et al,[11] the 2-factor models by Stanley et al[12] and Chou,[18] respectively, and the higher-order 3-factor model by Clara et al.[21] Chi-square test, root mean square error of approximation (RMSEA), comparative fit index (CFI) and Tucker-Lewis index (TLI) were used to evaluate the overall fit of each model. Since sample size can affect the outcome of chi-square test, we refrained from using its result to evaluate each model. Instead, we used the cut-offs of ≥0.95 for CFI and TLI and ≤0.06 for RMSEA proposed by Hu and Bentler as the criteria for best fit.[24] In multigroup CFA, a change of CFI <0.01 is indicative of a restrictive model.[25] The results were analysed in 3 parts.

First, CFA was performed on both groups using Mplus version 2.1.2.[26] The ordinal response categories were treated as continuous since they were sufficiently large in numbers (≥7).[27] Due to poor multivariate normality and the small number of subjects in our study, the results were analysed with maximum likelihood estimator.[28,29] Since the study of the 3-factor model in psychiatric subjects by Clara et al[21] had shown a negative result for significant others, we introduced a constraint in CFA to control for this variable.

Second, after the model with the best fit for the data was identified, we conducted multigroup CFA to determine measurement invariance by evaluating the consistency of the parameters—factor loadings, intercepts and error residuals—in both groups. Three measurement invariance models—each one with an increasing level of restrictiveness—were tested: configural invariance (to

determine whether factor structure fitted each group in the same manner), metric invariance (to gauge whether factor loadings were similar in both groups) and scalar invariance (to assess whether factor loadings and intercepts were similar in both groups).[28] When metric invariance is present, scores can be compared in both groups. However, the scores in each group can only be compared at a latent level when scalar invariance is present.[25,30]

Third, we used inverse probability weighting to control for confounding factors that arise from the assignment of subjects to both groups. Logistic regression analysis was used to determine the probability (propensity scores) of being in the psychiatric group as a function of the sociodemographic factors of age, education, ethnicity, gender and household income. Weights were calculated based on subjects' inverse probability (propensity score) of being in the psychiatric group. Descriptive analysis and weighted univariate analysis of variance were used to ascertain differences in MSPSS scores in both groups.

Results

There were 87 male and 122 female subjects in our study. The majority were Chinese (66.5%) followed by the Malays (17.2%), Indians (14.4%) and other ethnicities (1.9%). In both groups, the mean age of the participants was 23 years old. The baseline characteristics of both groups are shown in Table 1.

Our results showed that the internal consistency of MSPSS in both groups was excellent. In the non-psychiatric group, Cronbach's alphas for family, friends and significant others were 0.89, 0.90 and 0.94, respectively. In the psychiatric group, they were 0.90, 0.94 and 0.96, respectively.

Table 1. Baseline Characteristics of Subjects

Variable	Non-Psychiatric Group (n = 100)	Psychiatric Group (n = 109)
Age (mean ± SD, years)	23.5 ± 5.9	22.3 ± 6
Gender (%)		
Male	45 (21.5)	42 (20.1)
Female	55 (26.3)	67 (32.1)
Ethnicity (%)		
Chinese	60 (28.7)	79 (37.8)
Indian	22 (10.5)	8 (3.8)
Malay	15 (7.2)	21 (10.0)
Others	3 (1.4)	1 (0.5)
Education (%)		
Primary and below	11 (5.3)	12 (5.7)
Secondary	24 (11.5)	44 (21.1)
Post-Secondary	13 (6.2)	15 (7.2)
Diploma	12 (5.7)	26 (12.4)
Degree and above	40 (19.1)	12 (5.7)
Monthly household income (%)		
<S$2000	6 (2.9)	23 (11)
S$2000 – 3999	13 (6.2)	15 (7.2)
S$4000 – 5999	21 (10.0)	5 (2.4)
S$6000 – 9999	24 (11.5)	11 (5.3)
>S$10,000	7 (3.3)	5 (2.4)
Not applicable	4 (1.9)	8 (3.8)
Do not know	25 (12.0)	39 (18.7)
Declined to reveal	0 (0)	3 (1.4)

SD: Standard deviation

Using the criteria by Hu and Bentler,[24] the original 3-factor model by Zimet et al[11] and higher-order 3-factor model by Clara et al[21] were shown to have a good fit for the data. The comparative and global fit values were within the range (CFI and TFI, ≥0.95; RMSEA, ≤0.06) recommended by Hu and Bentler. On the other hand, the 2-factor models demonstrated a poor fit. The results of the fit indices, factor loadings and correlations are shown in Tables 2 and 3.

Multigroup CFA was also performed on the 3-factor model of Zimet et al[11] instead of the higher-order 3-factor model of Clara et al[21] after the latter showed a negative correlation for the variable, significant others, in their psychiatric subjects that may indicate errors in the parameters of their model. The results of multigroup CFA, RMSEA and CFI indicated an excellent fit for the configural and metric models. Additionally, a CFI difference of 0.001 supported a more restrictive model at the metric level. At the scalar level, RMSEA and CFI indicated fair to good fit of the data. However, a CFI difference of 0.04 meant that the intercepts between both groups were not the same and scalar invariance was not achieved. The fit indices are shown in Table 4.

Based on results of descriptive analyses, mean MSPSS scores were lowest for family and highest for significant others in both groups. Univariate analysis of variance showed significant differences between both groups for family ($F = 38.98$, $P < 0.001$), friends ($F = 58.74$, $P < 0.001$), significant others ($F = 14.95$, $P < 0.001$) and global perceived social support ($F = 52.71$, $P < 0.001$). Since the Cohen's d effect size ranged from 0.62 (medium) to 0.76 (large), the difference between both groups was substantial. The results of the descriptive and weighted univariate analyses are shown in Tables 1 and 5, respectively.

Discussion

The findings of previous studies on the factor structure of MSPSS were mixed. Our study aimed to validate the factor structure of MSPSS and to investigate the differences in perceived social support between young psychiatric and non-psychiatric subjects in a multi-cultural society in Asia.

The results of our study supported the factorial validity of the original 3-factor model of MSPSS by Zimet et al[11] and the higher-order 3-factor model by Clara et al.[21] The latter showed that the overarching measure—global perceived social support—was a meaningful measure of overall perceived social support. CFA suggests that both groups viewed the 3 domains of perceived social support—family, friends and significant others—as distinct from one another. Our findings did not support

Table 2. Results of Fit Indices for 2-Factor and 3-Factor MSPSS Models in Psychiatric and Non-Psychiatric Subjects

Subject	χ^2	df	χ^2/df	CFI	TLI	RMSEA	90% CI
Psychiatric group							
2-factor model							
Stanley et al*	253	53	4.78	0.823	0.779	0.186	0.163 – 0.209
Chou†	338	53	6.38	0.747	0.685	0.222	0.200 – 0.245
3-factor model							
Zimet et al‡	64.3	51	1.26	0.988	0.985	0.049	0.000 – 0.083
Clara et al§	64.1	52	1.23	0.989	0.986	0.046	0.000 – 0.080
Non-psychiatric group							
2-factor model							
Stanley et al*	207.21	53	3.91	0.780	0.26	0.171	0.146 – 0.195
Chou†	225.91	53	4.26	0.753	0.693	0.181	0.157 – 0.205
3-factor model							
Zimet et al‡	70.8	51	1.39	0.972	0.964	0.062	0.017 – 0.095
Clara et al§	70.8	51	1.39	0.972	0.964	0.062	0.017 – 0.095

CFI: Comparative fit index; CI: Confidence interval; df: Degrees of freedom; MSPSS: Multidimensional Scale of Perceived Social Support; RMSEA: Root mean square error of approximation; TLI: Tucker-Lewis index; χ^2: Chi-square test, χ^2/df: Ratio of chi-square to degrees of freedom
Note: All values were rounded to 3 significant figures.
*Stanley MA, Beck JG, Zebb BJ. Psychometric properties of the MSPSS in older adults. Aging Ment Health 1998;2:186–93.
†Chou KL. Assessing Chinese adolescents' social support: the Multidimensional Scale of Perceived Social Support. Pers Individ Dif 2000;28:299–307.
‡Zimet GD, Dahlem NW, Zimet SG, Farley GK. The Multidimensional Scale of Perceived Social Support. J Pers Assess 1988;52:30–41.
§Clara IP, Cox BJ, Enns MW, Murray LT, Torgrudc LJ. Confirmatory factor analysis of the Multidimensional Scale of Perceived Social Support in clinically distressed and student samples. J Pers Assess 2003;81:265–70.

Table 3. Standardised Factor Loadings and Correlations of 12-Item MSPSS Between Non-Psychiatric and Psychiatric Subjects

Variable	Factor Loading					
	Non-Psychiatric Group			Psychiatric Group		
	SO	FA	FR	SO	FA	FR
MSPSS						
1. There is a special person who is around when I am in need.	0.893			0.874		
2. There is a special person with whom I can share joys and sorrows.	0.924			0.986		
3. I have a special person who is a real source of comfort to me.	0.856			0.940		
4. There is a special person in my life who cares about my feelings.	0.905			0.914		
5. My family really tries to help me.		0.903			0.865	
6. I get the emotional help and support I need from my family.		0.959			0.949	
7. I can talk about my problems with my family.		0.792			0.776	
8. My family is willing to help me make decisions.		0.642			0.76	
9. My friends really try to help me.			0.851			0.900
10. I can count on my friends when things go wrong.			0.859			0.889
11. I have friends with whom I can share my joys and sorrows.			0.859			0.900
12. I can talk about my problems with my friends.			0.751			0.905
Factor correlations						
SO	-			-		
FA	0.616	-		0.462	-	
FR	0.432	0.375	-	0.492	0.217	-

FA: Family; FR: Friends; MSPSS: Multidimensional Scale of Perceived Social Support; SO: Significant others
Note: The results pertained to the 3-factor model by Zimet et al. All factor loadings are statistically significant at P <0.01.

Table 4. Results of Multigroup CFA on Goodness-of-Fit Indices for Invariance Models

Model	χ^2	df	χ^2 Difference	DF Difference	*P* Value	RMSEA	TLI	CFI	CFI Difference
Configural	135.32	102	-	-	0.0152	0.056	0.976	0.981	-
Metric	142.69	111	7.367	9	0.023	0.052	0.979	0.982	0.001
Scalar	226.17	123	83.481	12	<0.001	0.09	0.938	0.942	0.04

CFA: Confirmatory factor analysis; CFI: Comparative fit index; df: Degrees of freedom; RMSEA: Root mean square error of approximation; TLI: Tucker-Lewis index; χ^2: Chi-square test

Table 5. Results of Univariate Analysis of Variance for MSPSS in Non-Psychiatric and Psychiatric Subjects

MSPSS Domain	Non-Psychiatric Group (Mean ± SD)	Psychiatric Group (Mean ± SD)	Univariate Analysis of Variance			
			F Value	df	*P* Value	Cohen's *d*
Friends	5.72 ± 1.36	4.22 ± 2.43	58.74	1	<0.001	0.76
Family	5.52 ± 1.61	4.17 ± 2.62	38.98	1	<0.001	0.62
Significant others	5.81 ± 1.81	4.90 ± 2.84	14.95	1	<0.001	0.71
Global perceived social support	5.68 ± 1.32	4.43 ± 2.08	52.71	0	<0.001	0.72

df: Degrees of freedom; MSPSS: Multidimensional Scale of Perceived Social Support; SD: Standard deviation
Note: All values were rounded to the nearest 2 decimal places.

the 2-factor models by Stanley et al[12] and Chou.[18] The results of multigroup CFA also showed that MSPSS scores could be interpreted similarly between non-psychiatric and psychiatric subjects, but not at the latent level since scalar invariance was lacking.

Although MSPSS is widely used, there is, however, a lack of research and understanding of its factorial properties. The results of our CFA are significant in two ways. First, they supported the use of the original 3-factor model of MSPSS by Zimet et al[11] in a multicultural Asian setting since it had allowed meaningful comparisons to be made between non-psychiatric and psychiatric populations. Second, the results validated the use of the 3-factor model in a young population. Prior to our study, there was only one study on the subject in Singapore but it involved an adult population with schizophrenia.[21]

In our study, the psychiatric group reported significantly lower level of perceived social support than the non-psychiatric group. This result was expected since previous research findings had found a correlation between poor mental health and low perceived social support.[8,9,31] Depending on the level of suicide ideation, the MSPSS scores of the psychiatric subjects in our study—ranging from 3.85 to 4.89—corroborated those reported by patients with major depressive disorder in 6 Asian countries.[32]

Although our study did not specifically compare the 3 domains of social support, results of the descriptive analyses showed that subjects in both groups perceived lower support from their families than from friends and significant others, a finding which echoed that of another study.[21] This result is crucial since they could address how interventions can be targeted to help young indviduals.[8] The home is one of the first places in which mental health issues often surface. Likewise, it can be an important starting point to launch successful interventions that aid and benefit young individuals.[8,33] More research is needed on the role that the family plays to support younger individuals in Singapore and the factors that contribute to the low level of support perceived by them.

To the best of our knowledge, this is the first study that investigated perceived social support in young non-psychiatric and psychiatric subjects in Singapore. Previous studies had investigated this subject in either non-psychiatric or psychiatric participants, but not both. Since social support is linked to multiple psychosocial outcomes and mortality, the results of this study provide a preliminary comparison and understanding of perceived social support in young healthy and psychiatric individuals in Singapore.

A limitation of this study was its reliance on self-reported data. Although perceptions are best measured through self-report, confounding factors such as social desirability bias may unintentionally influence results in ways that over- or underestimate the MSPSS scores. Additionally, the subjects in our study were able to read and write English and the results may not be representative of those who are not proficient in that language.

Conclusion

Our study supported the use of the original 3-factor model of MSPSS by Zimet et al[11] in a young Asian population of non-psychiatric and psychiatric subjects. The scores of both groups revealed that the psychiatric group reported lower perceived social support in all domains of MSPSS than the non-psychiatric group. Additionally, both groups perceived support from family to be lower than that from friends and significant others. These results suggest that interventions that target the home may be helpful to enhance the support of family for young individuals with psychiatric conditions. Future research could expand on the findings of this study to examine the factors that contribute to perceived low familial support in psychiatric individuals in Singapore.

Acknowledgement

This study was supported by the National Medical Research Council of the Ministry of Health, Singapore, under the Centre Grant Programme (Grant No.: NMRC/CG/004/2014).

REFERENCES

1. House JS, Landis KR, Umberson D. Social relationships and health. Science 1988;241:540–5.
2. Uchino BN. Social support and health: a review of physiological processes potentially underlying links to disease outcomes. J Behav Med 2006;29:377–87.
3. Thoits PA. Social support and psychological well-being: theoretical possibilities. In: Sarason IG, Sarason BR, editors. Social Support: Theory, Research and Applications. Dordrecht: Springer; 1985. p. 51–72.
4. Holt-Lunstad J, Smith TB, Layton JB. Social relationships and mortality risk: a meta-analytic review. PLoS Med 2010;7:e1000316.
5. Thoits PA. Mechanisms linking social ties and support to physical and mental health. J Health Soc Behav 2011;52:145–61.
6. Malhotra R, Ang SJ. Social support for older adults–a bane or a boon for their health? Ann Acad Med Singapore 2016;45:172–3.
7. Ng CW, Tan WS, Gunapal PP, Wong LY, Heng BH. Association of socioeconomic status (SES) and social support with depressive symptoms among the elderly in Singapore. Ann Acad Med Singapore 2014;43:576–87.
8. Uchino BN, Bowen K, Kent R. Social support and mental health. In: Friedman H, Fingerman K, editors. Encyclopedia of Mental Health. 2nd ed. Oxford: Elsevier; 2016. p. 189–95.

9. Lakey B, Cronin A. Low social support and major depression: research, theory and methodological issues. In: Dobson KS, Dozois JA, editors. Risk Factors in Depression. San Diego, CA: Elsevier Academic Press; 2008. p. 385–408.
10. Casale M, Wild L, Cluver L, Kuo C. The relationship between social support and anxiety among caregivers of children in HIV-endemic South Africa. Psychol Health Med 2014;19:490–503.
11. Zimet GD, Dahlem NW, Zimet SG, Farley GK. The Multidimensional Scale of Perceived Social Support. J Pers Assess 1988;52:30–41.
12. Stanley MA, Beck JG, Zebb BJ. Psychometric properties of the MSPSS in older adults. Aging Ment Health 1998;2:186–93.
13. Canty-Mitchell J, Zimet GD. Psychometric properties of the Multidimensional Scale of Perceived Social Support in urban adolescents. Am J Community Psychol 2000;28:391–400.
14. Eker D, Arkar H. Perceived social support: psychometric properties of the MSPSS in normal and pathological groups in a developing country. Soc Psychiatry Psychiatr Epidemiol 1995;30:121–6.
15. Guan NC, Seng LH, Hway Ann AY, Hui KO. Factorial validity and reliability of the Malaysian simplified Chinese version of Multidimensional Scale of Perceived Social Support (MSPSS-SCV) among a group of university students. Asia Pac J Public Health 2015;27:225–31.
16. Guan NC, Sulaiman AR, Seng LH, Ann AY, Wahab S, Pillai SK. Factorial validity and reliability of the Tamil version of Multidimensional Scale of Perceived Social Support among a group of participants in University Malaya Medical Centre, Malaysia. Indian J Psychol Med 2013;35:385–8.
17. Ng CG, Amer Siddiq AN, Aida SA, Zainal NZ, Koh OH. Validation of the Malay version of the Multidimensional Scale of Perceived Social Support (MSPSS-M) among a group of medical students in Faculty of Medicine, University Malaya. Asian J Psychiatr 2010;3:3–6.
18. Chou KL. Assessing Chinese adolescents' social support: the Multidimensional Scale of Perceived Social Support. Pers Individ Dif 2000;28:299–307.
19. Akhtar A, Rahman A, Husain M, Chaudhry IB, Duddu V, Husain N. Multidimensional Scale of Perceived Social Support: psychometric properties in a South Asian population. J Obstet Gynaecol Res 2010;36:845–51.
20. Tonsing K, Zimet GD, Tse S. Assessing social support among South Asians: the Multidimensional Scale of Perceived Social Support. Asian J Psychiatr 2012;5:164–8.
21. Clara IP, Cox BJ, Enns MW, Murray LT, Torgrudc LJ. Confirmatory factor analysis of the Multidimensional Scale of Perceived Social Support in clinically distressed and student samples. J Pers Assess 2003;81:265–70.
22. Vaingankar JA, Abdin E, Chong SA. Exploratory and confirmatory factor analyses of the Multidimensional Scale of Perceived Social Support in patients with schizophrenia. Compr Psychiatry 2012;53:286–91.
23. Tong EM, Bishop GD, Diong SM, Enkelmann HC, Why YP, Ang J, et al. Social support and personality among male police officers in Singapore. Pers Individ Dif 2004;36:109–23.
24. Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct Equ Model 1999;6:1–55.
25. Milfont TL, Fischer R. Testing measurement invariance across groups: applications in cross-cultural research. Int J Psychol Res 2010;3:111–30.
26. Muthén LK, Muthén BO. Mplus User's Guide. 6th ed. Los Angeles, CA: Muthén & Muthén; 2007.
27. Dolan CV. Factor analysis of variables with 2, 3, 5 and 7 response categories: a comparison of categorical variable estimators using simulated data. Brit J Math Stat Psy 1994;47:309–26.
28. Cheng ST, Chan AC. The Multidimensional Scale of Perceived Social Support: dimensionality and age and gender differences in adolescents. Pers Individ Dif 2004;37:1359–69.
29. Li CH. Confirmatory factor analysis with ordinal data: comparing robust maximum likelihood and diagonally weighted least squares. Behav Res Methods 2016;48:936–49.
30. Van de Schoot R, Lugtig P, Hox J. A checklist for testing measurement invariance. Eur J Dev Psychol 2012;9:486–92.
31. Lakey B, Orehek E. Relational regulation theory: a new approach to explain the link between perceived social support and mental health. Psychol Rev 2011;118:482-95.
32. Lim AY, Lee AR, Hatim A, Tian-Mei S, Liu CY, Jeon HJ, et al. Clinical and sociodemographic correlates of suicidality in patients with major depressive disorder from six Asian countries. BMC Psychiatry 2014;14:37.
33. Repetti RL, Taylor SE, Seeman TE. Risky families: family social environments and the mental and physical health of offspring. Psychol Bull 2002;128:330–66.