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Life Satisfaction of Gifted and Average Adolescents in Hong Kong: Validation of the Chinese *Brief Multidimensional Students' Life Satisfaction Scale* (BMSLSS)

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Abstract

Despite the popularity of the *Brief Multidimensional Students' Life Satisfaction Scale* (BMSLSS) for use in research, this instrument has not yet been validated with adolescents of different intellectual ability levels and across different cultures. This study examined the psychometric properties and measurement equivalence of BMSLSS with a sample of 676 Chinese adolescents who are deemed 'gifted' and attending the Hong Kong Academy of Gifted Education, and 702 students with average achievement in mainstream high schools. Results indicated high internal consistency for the scale and a one-factor solution for BMSLSS with this population. Tests of configural, full metric and partial scalar invariance suggest that gifted students attending an academy conceptualize life satisfaction in a same way as their average attainment peers in regular schools. The findings support the applicability and measurement equivalence of BMSLSS for use with Chinese gifted and average-ability students.

Keywords BMSLSS · Chinese · Life satisfaction · Gifted students · Adolescents · Validity

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Introduction

Over the past decade, researchers have developed keen interests in topics of 'subjective wellbeing' and 'life satisfaction' among young people (Lippman et al., 2011; Proctor et al., 2009). Life satisfaction is a socio-cognitive construct that refers to one's overall perception of quality of life. The Organization for Economic Cooperation and Development (OECD) (an international and intergovernmental economic organization) describes life satisfaction as how people evaluate their life as a whole, rather than their current feelings (OECD, 2020). The level of life satisfaction is not equal across OECD countries, with some showing much higher average satisfaction than others.

A wide range of factors can influence life satisfaction of adults and youth, including demographics (age, gender, socioeconomic background), familial (family structure, parenting, life events), self-appraisal (self-concept, self-reliance, efficacy), and socio-environmental factors (school, neighborhood) (Gilman & Huebner, 2003; Proctor et al., 2009). Life satisfaction in children and adolescents, as a facet of their developmental trajectory, appears to shape (and is concurrently shaped by) short-term and longer-term influences such as coping competence, resilience, academic outcomes and psychological adjustment (Jiang et al., 2016; Jiang et al., 2019; Sun & Shek, 2010).

Early research had explored the possible role of intellectual giftedness in strengthening an individual's life satisfaction (Diener, 1994). For example, at that time it was claimed that gifted students are more resourceful and high achieving, therefore happier and more satisfied with their lives (Diener & Fujita, 1995). More recently, these findings were echoed by Lubinski and Benbow (2006) who reported high levels of life satisfaction among a large group of gifted youths in the U.S. More recent studies have also found that gifted children often possess good socio-emotional adjustment, and this in turn functions as a protective factor against difficulties in life that can undermine satisfaction (Francis et al., 2016). On the other hand, some personality traits evident in a few gifted students, such as perfectionism, may predispose them to obsessive and compulsive behaviors, leading to physiological stress and harm to their wellbeing and quality of life (Chan, 2007, 2012; Roberts & Lovett, 1994). Studies with gifted Chinese students have identified social pressure, particularly parents' high expectations, as a force in shaping their subjective wellbeing (Chen et al., 2018). This may arise because Chinese society has a long history of regarding and respecting giftedness more positively than perhaps occurs in the West (Huang et al., 2018; Vialle, 2007). Chinese students' academic excellence is highly valued by their parents, and students with high achievement are often given more attention and resources in school and family. There is an expectation that this will enhance their potential for securing well-paying jobs in the future (Li, 2017). However, studies have also confirmed that gifted students are often under immense academic pressure as a result of these very high expectations placed on them, and this can seriously erode life satisfaction (Chen et al., 2018; Huang et al., 2018). Evidence from these studies and from media reports indicate the necessity to understand better the levels of life satisfaction in Chinese gifted students, and how they may differ from students in the West and from their own peers who are less intelligent.

The extant research that has compared levels of life satisfaction in gifted students and regular students has yielded mixed findings. An early study by Huebner and Alderman (1993) had suggested that gifted students have higher sensitivity than regular

students in distinguishing among the various domains of life satisfaction. However, some recent studies have reported negligible difference in life satisfaction between gifted and regular students (Bergold et al., 2015; Chmiel et al., 2012). In a Korean study, Jin and Moon (2006) found that there was no significant difference in overall psychological wellbeing between gifted and regular students, but gifted students reported higher levels of *school* satisfaction than their counterparts.

The research on life satisfaction has almost all been conducted in Western settings with participants from individualistic societies. It not clear whether the findings also pertain equally to Asian populations where collectivist cultural influences on quality of life and wellbeing may be different (Proctor et al., 2009).

In order to explore the issues of whether life satisfaction is interpreted differently in different cultures, and whether high intellectual ability is a variable that may promote life satisfaction in a Chinese context, the psychometric evaluation of a life satisfaction scale is needed. Many of the available measures of life satisfaction have not been validated specifically among gifted students from any background, but one that could be appropriate is the *Brief Multidimensional Students' Life Satisfaction Scale* (BMSLSS). This instrument is widely used and quick to administer for children and adolescents aged 8–18 years (Seligson et al., 2005). The items within the scale capture overall and domain-specific satisfaction in areas of self, school, friends, family and environment. The use of the scale with American adolescent has revealed that it exhibits good internal consistency and high test-rest reliability (Ng et al., 2018). Research has also tended to support the psychometric properties of BMSLSS for use with clinical, medical and school samples (Athay et al., 2012; Janssens et al., 2016). Confirmatory factor analyses with data from children and adolescents have supported a one-factor solution (Ye et al., 2014). Abubakar and team (2015) conducted multi-group confirmatory factor analysis of BMSLSS with data from adolescents and young adults across 23 countries (including China) and concluded that the scale possesses good psychometric properties. Similarly, a study by Zeng et al. (2018) provided further evidence for the cross-cultural equivalence of BMSLSS among Chinese and American middle school students. Although BMSLSS has been validated in a general Chinese context and found to have adequate cross-cultural and linguistic equivalence (Abubakar et al., 2016; Ye et al., 2014; Zeng et al., 2018), it has not been validated using a sample of gifted students.

The main aims of this study were to establish the validity of BMSLSS for use with Chinese gifted students, and to assess its measurement equivalence across different levels of intelligence. In terms of measurement invariance, there are three levels of statistical equivalence to be considered: (i) *configural invariance*, referring to obtaining the same pattern of factor loadings of scale items across both groups; (ii) *metric invariance* is the equivalence of factor loadings linking items and constructs; and (iii) *scalar invariance* requires equivalence in both factor loading and intercepts across two groups. After ensuring measurement invariance of BMSLSS for gifted and average students, group level comparison of scores across groups may shed some light on whether intellectual ability is associated with stronger satisfaction with life in this Chinese sample. In reality, full scalar invariance is often difficult to obtain in practice, and it is sometimes necessary to release invariance constraints on some factor loadings or intercepts to achieve partial invariance (Meredith, 1993).

Methods

Participants and Procedures

Gifted Students

Participants in this study were 676 Chinese gifted students from Hong Kong Academy of Gifted Education. The sample comprised 51.9% boys and 48.1% girls, with an average age of 13.50 years (SD = 2.1). The Academy identifies gifted students in the age range 10 to 18, using evidence of the students' ability as reflected in their academic record at school, and additional evidence of creativity and task commitment. Talent performance in school and outside school is also taken into account. (Details of the selection processes used by the Academy can be found online at: www.hkage.org.hk/en.)

The second named author had requested approval to conduct data gathering activities at the Academy from the university's Human Research Ethics Committee (EA540112) and the Ethics Review Group of the Hong Kong Academy for Gifted Education. Emails inviting participation in the study were sent to all students at the Hong Kong Academy for Gifted Education and their parents. As a result, consent letters were obtained from the students and their parents. It should be noted that 72.6% students completed the survey online while 27.4% completed the survey at the end of a summer program for gifted students. In both cases, completing the survey took approximately 15 min.

Average Students

The average-ability students from regular schools were 702 Chinese students from 7 secondary schools in different regions of Hong Kong. The sample comprised 46.6% boys and 53.4% girls, with an average age of 13.61 (SD = 0.54). Approval to conduct data gathering activities was obtained from the university's Human Research Ethics Committee, and invitation letters were sent to Grade 7 to Grade 9 students and their parents. More than 95% students responded to our survey, those who refused were due to time conflict or low interest to participate. A teacher at the school provided key information on the scope, aim and contents of the proposed survey, and participants were encouraged to raise questions and seek clarification. Consent letters were then obtained from participating students and their parents. The students completed the survey in their classroom in about 20 min.

Data Collection Instrument

The *Brief Multidimensional Students' Life Satisfaction Scale* (BMSLSS) has 5 self-report items to evaluate students' life satisfaction in various domains. One additional item (item 6: 'overall satisfaction with my life') was used as a validity check (Seligson et al., 2005; Ye et al., 2014). A Chinese language version of BMSLSS, had already been produced and used by Ye et al. (2014), so this version was adopted without further changes. All respondents were asked to rate their satisfaction with family life, friendships, school experience, self, and environmental, using a Likert-type response style where 1 = terrible; 2 = unhappy; 3 = mostly dissatisfied; 4 = mixed feelings (about

equally satisfied and dissatisfied); 5 = mostly satisfied; 6 = pleased; 7 = delighted. The Cronbach's alphas for the 6-item scale were good for both samples: 0.887 for gifted students and 0.882 for regular students.

Data Analysis

Descriptive and t-test statistics were performed using SPSS; and Mplus 8.0 was used for factor analysis and measurement invariance analyses. Several steps were required to validate BMSLSS with these Chinese gifted students, and then determine measurement invariance when applied with regular students. First, an exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted with the data from the gifted students to examine factorial solution and factor loadings of BMSLSS. Data from half the gifted sample were used for EFA ($N = 322$) and the other half used for CFA ($N = 354$). After establishing measurement validity of BMSLSS with the gifted student sample, CFAs were again conducted in (non-split) gifted sample ($N = 676$) and the regular sample ($N = 702$). Multi-group CFA was then applied to test for configural invariance (same pattern of free loadings), metric invariance (common loadings), and scalar invariance (common loadings and intercepts) across the two groups. Results for partial strict invariance (common loadings, intercepts, and residual variances) were also recorded.

The fit indices used in this study to assess model fit were i) the comparative fit index (CFI) where values >0.90 indicate acceptable fit and > 0.95 suggest good fit; ii) root-mean-square error of approximation (RMSEA) where values <0.08 indicate acceptable fit, and < 0.05 suggest good fit. However, this value is sensitive to model complexity, a simple model with only few parameters may result a slightly larger RMSEA value; iii) standardized root-mean-square residual (SRMR) where values <0.05 indicate good fit. Chi-square and degree of freedom were also recorded as a point of rough reference, because the values are sensitive to large sample size ($N > 1300$ for our overall sample).

In addition to fit indices, modification indices (MI) that appeared to be large (>20) were reported to identify source of any model misfit (Saris et al., 2009). Addressing model misfit is a complex issue and it is always necessary to take into consideration theoretical, research and contextual knowledge in deciding whether to re-specify models. In terms of determining changes in model fit between two models, analysis involved applying Chen (2007)'s criterion of changes in CFA that are greater than 0.01 to indicate a significant change.

Results

Descriptive Statistics

The inter-correlations of the 5-item BMSLSS were moderately correlated with each other in gifted ($r = 0.48$–0.63, $p < 0.001$) and regular ($r = 0.41$–0.70, $p < 0.001$) student samples. The mean scores of BMSLSS items were higher for the gifted students than regular students, and subsequent t-test analysis indicated that the difference was statistically significant ($p < .001$) (Table 1). The total of BMSLSS scores for all students (inclusive of gifted and regular) are 5.31 for item 1, 5.53 for item 2, 5.23 for item 3, 5.0 for item 4, 5.23 for item 5, and 5.46 for item 6.

Table 1 Item correlations, means, standard deviations and Cronbach's alphas of BMSLSS in gifted and regular students

Item	Gifted Students						Average Students						t-test
	1	2	3	4	5	6	1	2	3	4	5	6	
1. Family	—						—						7.79***
2. Friend	0.48***	—					0.48***	—					4.40***
3. School	0.55***	0.54***	—				0.56***	0.70***	—				6.60***
4. Self	0.58***	0.42***	0.63***	—			0.48***	0.46***	0.51***	—			5.81***
5. Environment	0.62***	0.40***	0.48***	0.51***	—		0.59***	0.49***	0.41***	0.53***	—		4.26***
6. Overall	0.77***	0.54***	0.67***	0.72***	0.68***	—	0.69***	0.64***	0.63***	0.67***	0.70***	—	7.47***
Mean (SD)	5.59 (1.26)	5.66 (1.08)	5.45 (1.21)	5.22 (1.35)	5.67 (1.27)	5.69 (1.08)	5.03 (1.39)	5.39 (1.17)	5.01 (1.27)	4.79 (1.38)	5.38 (1.25)	5.23 (1.23)	—
Range	1–7	1–7	1–7	1–7	1–7	1–7	1–7	1–7	1–7	1–7	1–7	1–7	—
N	676	676	676	676	676	676	702	702	702	702	702	702	—
Cronbach's alpha	0.887						0.882						—

***$P < 0.001$

Factor Analysis of BMSLSS with Gifted Students: EFA and CFA

The EFA results based on the split sample ($N = 322$) supported a one-factor solution, accounting for 62.22% of total variance in the model. The factor loadings for family, friend, school, self, environment and overall were 0.83, 0.71, 0.81, 0.80, and 0.80 respectively. Further, the CFA results based on the other split sample ($N = 354$) had good fit with data (χ^2 (5) = 38.26, CFI = 0.952, SRMR = 0.034, RMSEA = 0.12, 90%CI = 0.09–0.14). The standardized factor loadings for family, friend, school, self, environment and overall were 0.77, 0.62, 0.77, 0.76, and 0.68 respectively.

Multi-Group Confirmatory Factor Analyses

After establishing one-factor solution for BMSLSS with Chinese gifted students through exploratory and confirmatory factor analysis, multigroup confirmatory factor analyses were conducted with the gifted (non-split $N = 676$) and regular ($N = 702$) students respectively. The results suggested that each model (gifted student: CFI = 0.95; SRMR = 0.033; RMSEA = 0.13, 90%CI = 0.10–0.16, χ^2(5) = 66.57; Regular students: CFI = 0.90; SRMR = 0.055; RMSEA = 0.18 90%CI = 0.15–0.19, χ^2 (5) = 166) had an adequate fit with the data.

The modification index nevertheless showed a high value in the correlations between item 2-friendship and 3-school experience in both models (MI > 40). Same issue was reported in Abubakar et al. (2016)'s multilevel invariance testing of BMSLSS in 23 countries. Relaxing the correlated error term for item 2 and 3 improved the configural model (Abubakar et al., 2016). The overlapping in interpretation meanings across these two domains-friendship and school experience-has been noticed by previous research (Elmore & Huebner, 2010). Indeed, for children who spend the majority of their time in school, friendship is mostly related to the school environment. This may be more prevalent in Asian or Chinese contexts as schoolwork and time in classroom make up the majority of children's time use (Chen et al., 2018). Based on research and model re-specification criteria (Satorra, 1989; Whittaker, 2012), it was decided to relax correlated error term of items 2 and 3.

The inclusion of this parameter made a substantial improvement to the model fit (gifted student sample: CFI = 0.97; SRMR = 0.026; RMSEA = 0.12, 90%CI = 0.09–0.15, χ^2(4) = 46.18; Regular student sample: CFI = 0.98, SRMR = 0.024, RMSEA = 0.10 90%CI = 0.07–0.14, χ^2(4) = 36.25). The changes in CFI scores were from 0.954 to 0.97 for gifted students and from 0.90 to 0.98, indicating a significant improve greater than 0.01 (Chen, 2007). The Fig. 1 presented the factor loadings from confirmatory factor analyses using gifted and mainstream student samples.

Multi-Group Analysis: Chinese Gifted ($N = 676$) and Regular ($N = 702$)

The overall analyses suggested that BMSLSS showed adequate equivalence between gifted and regular students. The scale possessed full configural and metric invariance as well as partial scalar invariance. The Goodness-of-Fit Indexes in Table 2 suggested that both configural and metric invariance model showed a good fit with data. The full scalar model showed an adequate fit with the data. However, the changes in CFI suggested that the model fit was significantly worse than the metric invariance model as ΔCFI (0.025) was greater than the cut-off of 0.01 (Chen, 2007). The Modification
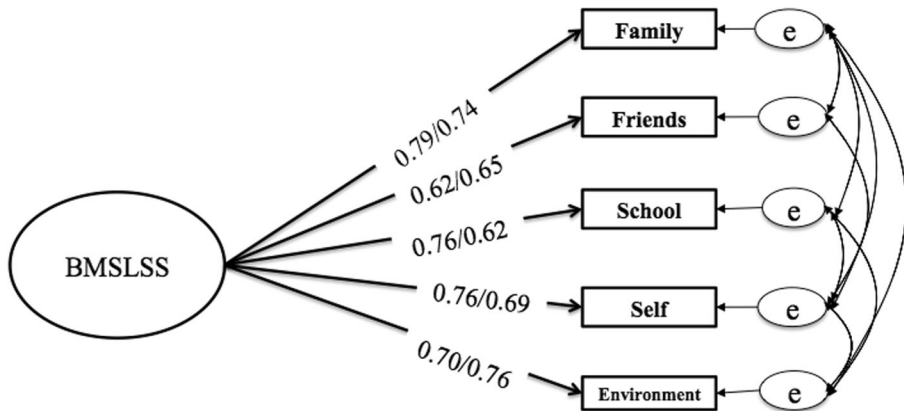
Fig. 1 Model illustration for confirmatory factor analysis for the BMSLSS using Chinese gifted student sample ($N = 676$) and regular student sample ($N = 702$). Standardized item coefficients are shown for Gifted /Regular student sample at p value less than 0.01

indices indicated large values for correlated error terms of item 3 and 4 in gifted student model (MI = 40) and item 3 and 5 in mainstream student model (MI = 29). After freeing these two parameters, the model fit greatly improved and partial scalar invariance was achieved across two groups.

Latent Mean Invariance

We tested whether factor mean (the latent variable made up of BMSLSS items) was invariant across two groups after ensuring partial scalar invariance. The results suggested that students in mainstream schools reported a significantly lower factor mean of BMSLSS than students in the gifted program (Estimates = −0.47, $p < 0.01$). This result was consistent with the observed mean-level differences in BMSLSS scores across two groups, with students in mainstream schools reporting statistically lower life satisfaction ($t = -7.47$, $p < 0.01$).

Table 2 Invariance models and goodness-of-fit indexes of the multi-group analysis for Chinese gifted ($N = 676$) and regular students ($N = 702$)

Model	χ^2 (df)	RMSEA (90%CI)	SRMR	CFI	ΔCFI
Configural[a]	82.44(8)	0.11 (0.09, 0.14)	0.02	0.97	
Metric	96.57(12)	0.10(0.08, 0.12)	0.05	0.97	ns
Scalar	168.65(17)	0.11(0.09, 0.13)	0.10	0.94	0.03
Partial Scalar[b]	91.66(15)	0.08(0.07, 0.10)	0.10	0.97	ns
Partial Strict[b]	130.23(20)	0.09 (0.08, 0.10)	0.13	0.96	0.01

Ns non-significant

RMSEA Root-mean-square error of approximation, *SRMR* Standardized root-mean-square residual, *CFI* Comparative fit index, *χ2* Chi-square test, *df* degree of freedom, *Δ* change in the model

[a] With residual covariance (Item 2 & 3) in both samples [b] with residual covariance (Item 3&4 for gifted student sample; Item 3 & 5 for mainstream student sample)

Discussion

This study achieved its aim by determining the psychometric soundness of BMSLSS when used with a sample of Chinese gifted students. The study also established that the scale is equally applicable for research with mainstream students of average ability. Findings from the study revealed that BMSLSS had adequate internal consistency, and yielded a one-factor solution for a Chinese gifted student sample. Results from EFA and CFA supported the underlying theoretical framework of life satisfaction as a global and multidimensional construct (Seligson et al., 2005; Ye et al., 2014). Although BMSLSS had been used widely in school and nonclinical samples, its applicability and usefulness with children from different cultural and intellectual ability groups has been less researched.

The measurement invariance tests, which included configural, metric, and scalar, provided further evidence that Chinese gifted students conceptualize and evaluate life satisfaction in the same way as their less academically capable peers. The results from multi-group analyses indicated full configural, full metric and partial scalar invariance. Gifted students responded to BMSLSS items and latent construct in the same way as their peers. After achieving partial scalar, latent mean comparison further suggested that gifted students rated their life more satisfactorily and positively than their peers in non-gifted program.

Results from t-test and latent mean comparisons both suggested that Chinese gifted students reported higher levels of BMSLSS as an overall evaluation as well as in various domains. More analysis and research are needed to ascertain if these differences could be partly attributable to intellectual traits. Ensuring measurement equivalence builds foundations for future studies that explore the nature, degree, and impact of these seemingly large differences.

The findings should be interpreted in light of limitations. This study was not able to obtain data on test-retest reliability. Given our dataset is cross-sectional, test-retest reliability and measurement invariance across time would require future studies. Chinese BMSLSS has been found reliable over a two-week interval (Ye et al., 2014), but research with longer time span is needed.

The findings bear significant practical and clinical implications in school settings. Teachers, school counsellors, and psychologists could utilize BMSLSS to monitor the overall level of life satisfaction in students, (particularly those who are presenting with emotional problems). Given that adolescent gifted students are often under greater social and academic pressure, using BMSLSS to evaluate their current wellbeing status would be a valuable step for a counsellor investigating the student's problems. The scale could also be used when evaluating any school program designed to increase the subjective wellbeing and happiness of gifted and regular students.

Conclusion

This study examined the equivalence of BMSLSS in a large sample of gifted and regular students in Hong Kong. The findings support the applicability and measurement equivalence of BMSLSS for use with Chinese gifted and average-ability students.

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