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ORIGINAL RESEARCH

Teachers Matter More Than Sites and Facilities: Provincial-Level Educational Predictors of Adolescent Life Satisfaction

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Purpose: Life satisfaction can predict students' school engagement and academic performance, and has shown significant regional differences among adolescents. The predictive effect of economic factors as regional characteristics on adolescent life satisfaction has been extensively examined; however, the regional educational factors that could predict adolescent life satisfaction remain unknown. This study aimed to identify provincial-level educational factors that can predict adolescent life satisfaction.

Methods: The participants comprised 16,737 students, aged 11–16 years (M_{age} = 13.82; SD_{age} = 0.77; 8767 girls, 7970 boys), from 31 provinces in China. Students completed measures on socioeconomic status and life satisfaction. Multilevel modeling was adopted in data analysis.

Results: Adolescent life satisfaction was positively correlated with family socioeconomic status, and negatively associated with age and academic ranking. Life satisfaction was lower for girls than boys. Some regional education development indicators could predict adolescent life satisfaction: ratio of students to teachers, ratio of students to teachers with master's degrees, and multimedia classroom size negatively correlated with adolescent life satisfaction; meanwhile per capita sports field area positively correlated with adolescent life satisfaction. Per capita education expenditure, classroom area, laboratory area, computer room area, language lab area, gymnasium area, green space area, sports field area, computers per student, number of books, and value of equipment and instruments could not significantly predict life satisfaction in this study.

Conclusion: The findings suggest that the life satisfaction of female adolescents, those in older age groups, with lower academic rankings and socioeconomic status, and those residing in regions with underdeveloped educational systems was relatively poor. These groups of adolescents should therefore be given special attention. To enhance their life satisfaction, some certain provinces should consider implementing measures such as increasing the number of teachers, reducing class sizes, and providing more opportunities for physical activity among junior middle school students.

Keywords: provincial-level, junior middle school students, life satisfaction, education, ecological systems theory

Introduction

Well-being is the ultimate pursuit of humankind. The engine model of well-being suggests that it helps people achieve positive outcomes.[1] Life satisfaction is an important component of well-being[2] that not only reflects how people evaluate their lives but also positively predicts adolescents' academic achievement and school engagement.[3,4] Therefore, exploration of environmental factors that could predict adolescent life satisfaction is needed to provide a reference for identifying adolescents with possible low life satisfaction early and formulating corresponding policy measures.

Life satisfaction in adolescents shows regional differences. For example, Newland et al found significant differences in life satisfaction among children and adolescents aged 9–14 years across 14 countries.[5] Main et al also reported significant differences in life satisfaction among children aged 8.10, and 12 years across 15 countries.[6] Moreover, Wu

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et al found significant differences in the life satisfaction of junior high school students across China's 31 provinces.[7] However, why life satisfaction among adolescents differs across regions has remained unclear.

Differences in regional development levels may help explain these regional variations in adolescent life satisfaction. Ecological systems theory suggests that the microsystem, mesosystem system, exosystem, and macrosystem in which a person is located all affect individual development.[8] Microsystems include family, school, peer, and community systems and, as the systems in which individuals experience the most direct interaction, they have a substantial impact on individual development. The mesosystem system is the connection between microsystems, which can affect individual development. Exosystems are those in which individuals are not directly involved, but still have an impact on their development, such as family socioeconomic status (SES). The macrosystem refers to an individual's overall environment (eg, culture, social environment, race), which also affects individual development. Livability theory posits that life satisfaction depends on the objective quality of the living conditions in a region.[9] Many regional factors contribute to improving quality of life, such as economic development and educational opportunities.[10] Thus, ecological systems theory and livability theory both suggest that regional-level factors, such as the macrosystem, may affect adolescent life satisfaction.

The predictive effects of regional-level economic factors as macrosystems on adolescent life satisfaction have been extensively examined; however, the results generally show that regional or per capita gross domestic product (GDP) do not have a significant predictive effect on adolescent life satisfaction.[5–7,11–13] One explanation of this may be that economic growth increases work stress for adults,[14] leading to role overload for parents and increased parental conflict with adolescents, thereby damaging adolescent life satisfaction and counteracting the positive effect of economic development on adolescent life satisfaction.[7] In this study, we mainly adopted the hypothesis that outer systems (the exosystem and macrosystem), particularly the macrosystem could predict adolescent development. Moreover, as the predictive effects of microsystems and mesosystems on adolescent life satisfaction has been extensively examined,[15–18] they were not included in this study.

Regional-level educational factors in the macrosystem have also received research attention as possible predictors of adolescent life satisfaction. Researchers have proposed that per capita years of education is the most appropriate indicator of educational development attainment in a region.[19] Wu et al found that per capita years of education at the provincial level could positively predict the life satisfaction of middle school students in China.[7] However, another study found that the percentage of education expenditure in regional GDP did not significantly predict adolescent life satisfaction,[11] which may be due to this indicator not being representative of the actual educational resources adolescents obtained. To the best of our knowledge, no other educational factors at the regional level have been examined to determine their potential predictive effect on adolescents' life satisfaction. Liu et al proposed that regional-level educational resources, including education expenditure per student and student–teacher ratio, could predict adolescent academic engagement.[20] Previous studies have reported the general beliefs among teachers that, as class size increases, they will find it more difficult to meet students' needs, efficiently prepare and evaluate lessons, and complete teaching tasks.[21] Johnson found that, in small classes, teachers have more teaching time and opportunities for individualized teaching, and the teaching environment is more conducive to students' positive physical, social, and emotional development.[22] Previous findings indicated that an expansion in class size led to a corresponding rise in students' levels of depression and mental health.[23,24] These previous findings suggest that regional factors reflecting educational resource levels may predict adolescent life satisfaction; however, this still requires further examination.

China issued the "National Medium and Long-term Education Reform and Development Plan (2010–2020)" in 2010, proposing to enhance the standardization of compulsory education institutions and achieve an equitable allocation of teachers, resources, instructional materials, school facilities, and so on while establishing national basic standards for ensuring quality and implementing a monitoring system for compulsory education. In 2019, 95.32% of counties (cities and districts) in China passed the supervision and evaluation of the balanced development of compulsory education.[25] The predictive effect of standardized construction in compulsory education schools on students' academic performance has been examined;[26] nevertheless, its potential to predict students' life satisfaction remains unexplored, particularly regarding the specific aspects of effects of per capita teaching and auxiliary room area, student-teacher ratio, class size, per capita education expenditure and teaching attachments.

Exploring regional educational factors in the macrosystem that may predict adolescent life satisfaction can provide valuable insights for governments to adjust corresponding policies. For instance, the findings from such research could help indicate whether introducing teachers and increasing educational funding is necessary in certain regions. Therefore, building on previous studies,[7,20] this research aimed to examine the predictive effect of regional-level educational indicators on the life satisfaction of junior high school students. Specifically, these indicators included per student general public budget education funds (per student education funds), student–teacher ratio, student–master degree teacher ratios, multimedia classroom class size, per capita classroom area, laboratory area, computer room area, language lab area, gymnasium area, green space area, sports field area, quantity of books, computer units, and value of equipment and instruments.

Family SES, as an exosystem component, positively predicts adolescent life satisfaction.[7] Gender, age, and academic performance may individually have significant predictive effects on adolescent life satisfaction. Previous studies have reported that life satisfaction is significantly higher for boys than girls,[5,27] negatively associated with age in adolescents,[5,6,27] and positively associated with better academic performance.[4,28] Therefore, this study included family SES as an exosystem factor, and age, gender, and academic performance ranking as individual-level variables during the data analysis.

Therefore, this study aimed to identify provincial-level educational factors that can predict adolescent life satisfaction. Based on previous studies and theories, adolescent life satisfaction was expected to be negatively related to student–teacher ratio, student–master degree teacher ratio, and multimedia classroom class size, but share a positive or no correlation with per student education funds. However, since few studies have focused on the predictive effects of other provincial-level educational factors, the predictive effects of these factors were examined, but no specific outcomes were hypothesized.

Method

Participants

This cross-sectional study collected data from junior high school students across 31 different provinces in China. We disseminated notices on WeChat Moments from May to June 2019 to recruit participants. The data were preprocessed in three steps. First, referring to the method adopted by Liu et al[20] five items were used to test social expectations, as follows: “I never cry”, “I never break an appointment”, “I never swear”, “I never eat snacks”, and “I never lie”. Participants rated each item on a five-point Likert scale ranging from 1 = *strongly disagree* to 5 = *strongly agree*. We excluded 1655 participants who scored an average of more than four points on these five items. Then, 889 participants with missing values for family SES, gender, age, academic ranking, or life satisfaction items were removed. Finally, 109 students were excluded because some of their life satisfaction scores were three standard deviations or more from the mean.[29] The final sample comprised 16,737 students (8767 girls and 7970 boys; mean $[M]_{age}$ = 13.82; standard deviation [*SD*] = 0.77). The detailed participant information is provided in Table 1.

Measures

Life Satisfaction

Life satisfaction was measured with a 21-item life satisfaction subscale of the Adolescent Well-being Scale.[30,31] Participants responded to each item on a five-point scale ranging from 1 = *does not correspond at all* to 5 = *corresponds exactly*. In this study, Cronbach’s α coefficient for this questionnaire ranged from 0.83 to 0.93. We assessed the metric and scalar invariance for the scale across 31 provinces. The details of factor Invariances of the life satisfaction are reported in Supplementary Material, and the measurement invariance of the life satisfaction across 31 provinces are shown in Table S1.

Family Socioeconomic Status

To measure family SES, applying the method of Liu et al[20] participants were asked to select their parents’ occupation and education level from a list of options. Options for parents’ occupation included unemployed, service worker or manual

Table 1 Demographics and Means of Life Satisfaction for Each of the 31 Provinces

Province	N	Age		Female (%)	SES	Life Satisfaction
		M	SD			
Beijing	504	14.21	0.72	51.19	1.20	4.15
Tianjin	94	13.59	0.63	53.19	0.74	3.88
Hebei	87	14.28	0.80	70.11	−0.53	3.78
Shanxi	182	13.33	0.74	46.70	0.11	3.96
Inner Mongolia	580	14.04	0.72	53.45	−0.43	3.94
Liaoning	1147	13.60	0.72	53.79	0.08	4.06
Jilin	4384	13.76	0.73	54.90	−0.23	3.99
Heilongjiang	675	13.87	0.67	55.26	0.47	4.03
Shanghai	212	13.84	0.61	52.83	0.49	4.00
Jiangsu	369	13.64	0.61	60.70	−0.19	3.89
Zhejiang	533	14.21	0.86	42.96	−0.05	3.69
Anhui	364	14.07	0.89	47.53	0.37	4.06
Fujian	438	13.72	0.63	52.97	−0.03	3.82
Jiangxi	102	13.83	0.74	50.00	−0.55	3.45
Shandong	63	13.43	0.52	53.97	−0.23	4.01
Henan	134	14.48	0.66	61.94	0.53	4.04
Hubei	751	13.74	0.81	68.04	−0.08	3.65
Hunan	77	14.35	0.59	53.25	−0.33	3.68
Guangdong	3206	13.69	0.70	45.70	0.07	3.81
Guangxi	418	13.90	0.70	36.36	−0.17	3.89
Hainan	56	13.31	0.48	41.07	0.36	3.84
Chongqing	119	13.91	0.69	47.06	0.40	4.04
Sichuan	328	14.29	0.87	55.18	0.85	3.84
Guizhou	170	14.02	0.94	54.71	−0.46	3.58
Yunnan	745	13.79	0.75	54.77	−0.11	3.75
Tibet	67	14.52	0.73	53.73	−0.18	3.76
Shaanxi	93	14.29	0.97	50.54	−0.62	3.86
Gansu	277	14.01	0.87	54.51	−0.64	3.61
Qinghai	169	14.41	0.83	46.75	−0.44	3.69
Ningxia	251	13.44	0.63	55.78	0.68	4.12
Xinjiang	142	14.81	0.72	59.86	−0.32	4.02

laborer, transactional worker, self-employed with no or a few employees, owner of a large or medium-sized enterprise, corporate middle manager, military or police personnel, or professional or technical personnel or national public official. The options for parents' education level options were primary school or below, junior high school, senior high school or technical secondary school, junior college, bachelor's degree, or master's degree or above. For parental occupations, the first four categories were coded as 1, and the last five were coded as 2. The education levels were coded as 1–6, respectively. The scores for parents' occupation and education level were standardized and summed to form a single SES index.

Gender and Age

Participants reported whether they were male (0) or female (1), as well as their date of birth, which was used to calculate their age.

Academic Performance Ranking

Participants reported their academic performance ranking in their grades. Using a three-point scoring method, the top 30%, middle 30~70%, and bottom 30% were scored as 1, 2, and 3, respectively.

Provincial-Level Educational Factors

The latest educational factors for each province were obtained on the website of the Chinese Ministry of Education (www.moe.gov.cn) before the survey, including education funds in the general public budget in 2018 (hereinafter referred to as "education funds per student"). According to the Ministry of Education's online report regarding the number of students or classes, the following indicators were calculated: student–teacher ratio (number of students divided by number of full-time teachers), student–master degree teacher ratio (number of students divided by number of teachers with a master's degree), multimedia classroom class size, and per capita classroom area, laboratory area, computer room area, language lab area, gymnasium area, green space area, sports field area, quantity of books, computer units, and value of equipment and instruments. The calculation method for per capita level involves dividing the total quantity by the current enrollment count.

Data Analysis

The data were analyzed using SPSS 22.0, Amos 22.0, and R 4.3.1 software, mainly for descriptive statistics, confirmatory factor analysis, and multilevel modeling (MLM). Provincial-level variables were grand mean-centered. Following the method adopted by Wu et al[7] for using MLM to examine the predictive effects of two-level factors, three steps were used to achieve our research objective. First, a null model (Model 1 in Table 2) was built to calculate the intraclass correlation coefficient (ICC), as an index of the proportion of between-province variations in life satisfaction. Then, we examined the relationships between family SES, gender, age, academic performance, and life satisfaction using a random intercept MLM (Model 2 in Table 2). Lastly, we added provincial-level educational factors to examine the relationships between provincial-level educational factors and adolescent life satisfaction. Since the provincial-level educational factors were significantly related to each other ($|rs| > 0.3$, $ps < 0.05$) in the sample, we built 14 separate models (Models 3–16 in Table 2) to examine the relationships to avoid the problem of multicollinearity.[7]

Table 2 Parameter Estimates from the Two-Level Multilevel Regression Models Predicting Students' Life Satisfaction

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
SES (γ_{10})		0.097*** (0.008)	0.096*** (0.008)	0.097*** (0.008)	0.097*** (0.008)	0.097*** (0.008)	0.097*** (0.008)	0.097*** (0.008)
Age (γ_{20})		–0.063*** (0.008)	–0.063*** (0.008)	–0.063*** (0.008)	–0.062*** (0.008)	–0.063*** (0.008)	–0.063*** (0.008)	–0.063*** (0.008)
Gender (γ_{30})		–0.059*** (0.007)	–0.059*** (0.007)	–0.059*** (0.007)	–0.059*** (0.007)	–0.059*** (0.007)	–0.059*** (0.007)	–0.059*** (0.007)
Academic Ranking (γ_{40})		–0.162*** (0.008)	–0.162*** (0.008)	–0.162*** (0.008)	–0.162*** (0.008)	–0.162*** (0.008)	–0.162*** (0.008)	–0.162*** (0.008)
Per student education funds (γ_{01})			0.037 (0.032)					
Student-teacher ratio (γ_{02})				–0.092** (0.032)				
Student-master degree teacher ratio (γ_{03})					–0.066* (0.027)			
Multimedia classroom class size (γ_{04})						–0.062* (0.029)		
Per capita classroom area (γ_{05})							0.034 (0.034)	
Per capita laboratory area (γ_{06})								0.039 (0.024)
Level-2 (τ_{00})	0.02766	0.01885	0.01860	0.01472	0.01592	0.01686	0.01897	0.01788
Level-1 (σ^2)	0.46161	0.44030	0.44030	0.44030	0.44030	0.44029	0.44030	0.44030
R^2			0.0133	0.2191	0.1554	0.1056	–0.0064	0.0515
ICC	0.05654	0.04106	0.04053	0.03235	0.03489	0.03688	0.04130	0.03903

(*Continued*)

Table 2 (Continued).

	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16
SES (γ_{10})	0.097*** (0.008)	0.097*** (0.008)	0.097*** (0.008)	0.097*** (0.008)	0.097*** (0.008)	0.097*** (0.008)	0.097*** (0.008)	0.096*** (0.008)
Age (γ_{20})	–0.063*** (0.008)	–0.063*** (0.008)	–0.063*** (0.008)	–0.063*** (0.008)	–0.062*** (0.008)	–0.063*** (0.008)	–0.063*** (0.008)	–0.063*** (0.008)
Gender (γ_{30})	–0.059*** (0.007)	–0.059*** (0.007)	–0.059*** (0.007)	–0.059*** (0.007)	–0.059*** (0.007)	–0.059*** (0.007)	–0.059*** (0.007)	–0.059*** (0.007)
Academic Ranking (γ_{40})	–0.162*** (0.008)	–0.162*** (0.008)	–0.162*** (0.008)	–0.162*** (0.008)	–0.162*** (0.008)	–0.162*** (0.008)	–0.162*** (0.008)	–0.162*** (0.008)
Per capita computer room area (γ_{07})	0.047 (0.030)							
Per capita language lab area (γ_{08})		0.012 (0.037)						
Per capita gymnasium area (γ_{09})			0.024 (0.032)					
Per capita green land area (γ_{010})				0.006 (0.032)				
Per capita sports field area (γ_{011})					0.083* (0.038)			
Per capita quantity of books (γ_{012})						0.013 (0.032)		
Per capita computer units (γ_{013})							0.056^{+} (0.031)	
Per capita value of equipment and instruments (γ_{014})								0.059^{+}(0.030)
Level-2 (τ_{00})	0.01793	0.01949	0.01919	0.01958	0.01628	0.01948	0.01744	0.01707
Level-1 (σ^2)	0.44030	0.44030	0.44030	0.44030	0.44031	0.44030	0.44030	0.44030
R^2					0.1363			
ICC	0.03913	0.04239	0.04176	0.04257	0.03566	0.04236	0.03810	0.03732

Notes: Gender (male = 0, female = 1). The fixed effects' coefficients (γ_{10}, γ_{20}, γ_{30}, γ_{01}, $\gamma_{02}\gamma_{14}$) were all standardized. R^2 refers to the proportion of variance explained at level-2, $R^2 = (\tau_{00(\text{model 2})} - \tau_{00(\text{model 3.16})})/ \tau_{00(\text{model 2})}$. $^{+}p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

Results

Unconditional Model for Life Satisfaction

Model 1 in Table 2 was used to investigate whether adolescent life satisfaction differed significantly among provinces in this study. The results showed significant regional differences in life satisfaction scores. The ICC was 0.057, indicating that provincial-level difference explained 5.70% of the total variance, which was within the common range for MLM.[32]

Relationships Between Student-Level Variables and Life Satisfaction

Building on Model 1, Model 2 added family SES, age, gender, and performance ranking to examine whether these factors were significant predictors of life satisfaction among participants. According to the results of Model 2 in Table 2, adolescent life satisfaction was positively correlated with family SES ($\gamma_{10} = 0.097$, standard error; SE = 0.008, $t = 11.70$, $p < 0.001$, 95% confidence interval; CI [0.081, 0.113]) and negatively correlated with age ($\gamma_{20} = –0.063$, SE = 0.008, $t = –8.05$, $p < 0.001$, 95% CI [–0.078, –0.047]), gender ($\gamma_{30} = –0.059$, SE = 0.007, $t = –7.87$, $p < 0.001$, 95% CI [–0.074, –0.044]; ie, the life satisfaction of girls was lower than that of boys), and academic performance ranking ($\gamma_{40} = –0.162$, SE = 0.008, $t = –21.49$, $p < 0.001$, 95% CI [–0.177, –0.147]).

Relationships Between Provincial-Level Educational Factors and Life Satisfaction

Based on Model 2, we developed 14 separate models (Models 3–16 in Table 2) to examine the relationships between provincial-level educational factors and life satisfaction. We found significant correlations with provincial-level educational factors as follows: student–teacher ratio ($\gamma_{02} = –0.092$, SE = 0.032, $t = –2.88$, $p = 0.008$, 95% CI [–0.158, –0.027]);

student–master teacher ratio (γ_{03} = –0.066, SE = 0.027, t = –2.46, p = 0.020, 95% CI [–0.121, –0.011]); multimedia classroom class size (γ_{04} = – 0.062, SE = 0.029, t = –2.10, p = 0.044, 95% CI [–0.122, –0.002]); and per capita sports field area (γ_{011} = 0.083, SE = 0.038, t = 2.19, p = 0.038, 95% CI [0.005, 0.161]).

We found nonsignificant correlations with the following provincial-level educational factors: number of computers per student (γ_{013} = 0.056, SE = 0.031, t = 1.82, p = 0.080, 95% CI [–0.007, 0.119]); per capita value of equipment and instruments (γ_{014} = 0.059, SE = 0.030, t = 1.94, p = 0.063, 95% CI [–0.004, 0.121]); education funds per student (γ_{01} = 0.037, SE = 0.032, t = 1.16, p = 0.257, 95% CI [–0.028, 0.102]); per capita classroom area (γ_{05} = 0.034, SE = 0.034, t = 0.98, p = 0.336, 95% CI [–0.037, 0.104]); per capita laboratory area (γ_{06} = 0.039, SE = 0.024, t = 1.62, p = 0.116, 95% CI [–0.010, 0.088]); per capita computer room area (γ_{07} = 0.047, SE = 0.030, t = 1.58, p = 0.125, 95% CI [–0.014, 0.107]); per capita language lab area (γ_{08} = 0.012, SE = 0.037, t = 0.33, p = 0.742, 95% CI [–0.063, 0.087]); per capita gymnasium area (γ_{09} = 0.024, SE = 0.032, t = 0.77, p = 0.450, 95% CI [–0.041, 0.089]); per capita green space area (γ_{010} = 0.006, SE = 0.032, t = 0.17, p = 0.865, 95% CI [–0.061, 0.072]); and per capita quantity of books (γ_{012} = 0.013, SE = 0.032, t = 0.42, p = 0.679, 95% CI [–0.051, 0.078]).

In summary, the findings demonstrated decreases in life satisfaction as student–teacher ratio, student–master teacher ratio, and multimedia classroom class size increased, but increases in life satisfaction as per capita sports field area increased. The other provincial-level educational factors were not significantly associated with life satisfaction in this present sample.

Discussion

This study found significant differences in the life satisfaction of junior high school students across different provinces in China. The ICC in the null model of this study was 0.057, indicating that differences between provinces accounted for 5.70% of the total variance in adolescent life satisfaction. Newland et al found that the differences between 14 countries across Africa, Asia, Europe, North America, and South America accounted for 14% of the total variance in adolescent life satisfaction.[5] Before including individual variables, the proportion of regional differences in the null model in this study was less than that found by Newland et al.[5] This may have been because the participants in this study were from the same country and all junior high school students; therefore, the homogeneity among participants was relatively higher in this study than in Newland et al,[5] who collected data from countries on different continents and included both primary and secondary school students.

As expected, this exploratory study found that the student–teacher ratio, student–master teacher ratio, and multimedia classroom class size negatively correlated with adolescent life satisfaction. Higher student–teacher ratios and larger multimedia classes would lead to teachers being able to provide less guidance for each student. The higher the student–master teacher ratio, the fewer the teachers with master's degrees in each class. When schools have a sufficient number of teachers, teachers instruct and interact with fewer students; thus, they can devote more time to individual students to provide academic guidance. In addition, more interaction between teachers and students is conducive to establishing close teacher–student relationships and improving student life satisfaction.[33] When teachers are highly educated, they can provide students with a higher level of instruction and guidance, thereby promoting students' overall development[34,35] and improving their life satisfaction. However, when teachers are scarce, teachers will have more students to guide, meaning that each student will receive only limited teacher attention and academic problems may not be solved in a timely manner. This situation is also not conducive to establishing close teacher–student relationships and will lead to lower life satisfaction. However, we found that the indicators for funds and school facilities and sites were not correlated with adolescent life satisfaction, including per capita education funds, classroom area, laboratory area, computer room area, language lab area, gymnasium area, green space area, quantity of books, computer units, and value of equipment and instruments. The reason for this may be that students felt that the current school sites (excluding sports areas) and facilities were sufficient. Therefore, schools need to staff a sufficient number of teachers, especially highly educated teachers, and do not need to pay excessive attention to improving the sites and facilities noted above.

This study found that the larger the per capita sports field area, the higher students' life satisfaction level. A larger per capita sports field area indicates that a school focuses more attention on students' physical activities, provides more venues for physical activity, and increases students' opportunities to participate in sports. Studies have found that physical activity promotes individual positive emotions[36] and improves life satisfaction.[37] According to the thermogenic

hypothesis,[38] physical activity can improve mood by simply raising body temperature. In addition, several types of physical activity can increase norepinephrine, serotonin, and dopamine levels in the brain, which are associated with well-being.[39] Chinese middle school students face high academic and college entrance pressure.[40] Therefore, schools should provide students with sufficient sports venues and encourage their full use of them to promote healthy physical and mental development in adolescents.

In summary, this study's results suggest that smaller class sizes or lower ratios of students to teachers (especially those with master's degree), as well as more areas for sports in schools, are likely to positively affect adolescent life satisfaction.

Conclusion

The findings of this study suggest that the life satisfaction of female adolescents, particularly those in older age groups, with lower academic rankings and socioeconomic status, residing in regions with underdeveloped educational systems is relatively poor. These specific groups of adolescents should be given special attention.

This study is the first to discover that regional education development indicators such as the ratio of students to teachers and teachers with master's degrees, as well as multimedia classroom size, have a negative predictive effect on adolescent life satisfaction. Conversely, per capita sports field area had a positive predictive effect on adolescent life satisfaction. This implies that schools should consider introducing more teachers, reducing class sizes, and improving opportunities for physical activity among students.

On the contrary, factors such as per capita education expenditure, classroom area, laboratory area, computer room area, language lab area, gymnasium area, green space area, sports field area, computers per student, number of books, and value of equipment and instruments did not significantly predict life satisfaction among adolescents. Therefore, it may not be necessary to allocate excessive resources toward these aspects in order to improve adolescent life satisfaction.

Limitations and Future Research Directions

In this study, the number of samples varied greatly among provinces, and the sampling was not conducted according to a stratified method. However, the number of samples was over 50 in each province, which is in line with the suggestions of Kreft (Kreft IGG. Are Multilevel Techniques Necessary? An Overview Including Simulation Studies (Unpublished manuscript). Los Angeles: California State University; 1996). Future studies could use stratified sampling to further explore regional differences in adolescent life satisfaction.

This study did not examine the predictive effects of microsystems and mesosystems on adolescent life satisfaction, which have been examined extensively.[15–18] However, future studies could include these two systems to examine how the macrosystem predicts adolescent life satisfaction through them.

This study found that regional-level educational factors have only a small predictive effect on adolescent life satisfaction, possibly because these regional-level educational indicators represent the average level of each aspect in a province, at the macro level. Future studies can include proximal environmental factors to examine their predictive effects, such as the student–teacher ratio per class.

Practical Implications

Special attention should be focused on female adolescents, those in older age groups, individuals from low socio-economic backgrounds, and those with lower academic rankings in relation to their levels of life satisfaction as these adolescents may demonstrate comparatively diminished levels of life satisfaction compared to their counterparts. The findings of this study suggest that, in order to enhance adolescent life satisfaction, certain provinces should implement an adequate number of teachers (particularly highly educated teachers), decrease class sizes, and provide more space for students to engage in sports activities. However, there is no necessity to prioritize the improvement of facilities and sites as a means to enhance adolescent life satisfaction. Furthermore, according to the ecological systems theory, the provision of sufficient activities and facilities encompassing cognitive, psychomotor, and affective domains serves as a significant predictor for achieving overall well-being among adolescents.

Data Sharing Statement

The data collected and analyzed in this study are available on request from the corresponding author.

Ethics Approval and Informed Consent

This study involving human participants was reviewed and approved by the Ethics Committee of the School of Psychology, Northeast Normal University (Reference No. 201906). The research was conducted in line with the Helsinki Declaration. All participants and their parents gave informed written consent. The data was collected after receiving ethical permission.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

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