RESEARCH ARTICLE

Gender differences in height, weight and BMI on self-esteem among rural school-aged children in China

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Abstract: 3,344 Children aged between 10 to 16 years from grade 4 to 10 were recruited to explore potential explanatory variables of low self-esteem among rural school-aged children in China. The results showed that the RSE scores were slightly higher for girls than for boys and higher academic achievement didn't contribute higher RSE scores in rural China. A lower height Z-scores resulted in a lower self-esteem in girls, and low SE was associated with height Z-score less than -1 versus scores more than -1 (OR=1.69, 95% CI 1.19-2.38, P=0.003). The findings indicated that it was height and BMI rather than weight to girls and weight to boys that were significantly associated with low self-esteem in rural China under the premise of very low rate of obesity.

Keywords: Gender Differences, Self-esteem, BMI

Self-esteem, also called self-worth, is a major predictor of satisfaction with life. A number of studies have investigated the factors that affect self-esteem on children, and current research focus such as the impacts of gender,[1] socio-economic status,[2] academic achievement,[3] age,[4] weight[5,6] and BMI[7] on self-esteem often reached conflicting conclusions in different areas or in different population. A theory of social comparisons explains how individuals evaluate their own opinions and abilities by comparing themselves to others who are similar to the self or who are upward (superior to the self) or downward (inferior to the self) on some attributes or dimensions, children or early adolescents assess whether they did better or worse than classmates in different but important areas.[8–10] These comparisons play an important role in shaping the childs self-esteem and influence the positive or negative feelings they have about themselves.[9–11]

As part of the attempt to understand self-esteem, gender differences often have been examined.[12–15] Results are mixed, researchers have found higher scores for male participants, higher scores for female participants, and no gender difference in self-esteem. For example, most early studies demonstrated no gender difference for children under 12 years, for adolescents, and for adults, but a reanalysis and update of these same studies showed that men were higher than women in self-esteem.[12, 16–19] However, in a prior meta-analysis of the literature, Sahlstein and Allen found that women scored higher than men on comprehensive measures and on the cognitive aspect of self-esteem, but men scored higher than women on social and physical aspects and most differences were small in size.[20]

During the school years, academic achievement is considered as an important contributor to self-esteem development. A student consistently achieving success or consistently failing strongly affects their individual self-esteem.[21–24] Despite popular beliefs that high self-esteem facilitates academic achievement, only a modest correlation was discovered between general self-esteem and school performance.[25] A prior meta-analysis estimated that the effect of the favorable influence of positive self-beliefs on academic achievement is modest and the overall estimated relation is about 0.08.[26]

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Associations between overweight and psychosocial factors have been inconsistent, with some studies reporting an inverse relationship between BMI and self-esteem, and others showing no association.[27–30] Some of the postulated reasons for the divergent findings include methodological differences in measuring self-esteem, differences in samples surveyed (clinical and nonclinical groups), and in sociodemographic profiles. Previous studies have found that taller adults tend to enjoy better mental health than their counterparts of average and below-average stature. For instance, Osika and Montgomery found that height was associated with a reduced risk of reporting low mood among adults 18 years of age and older.[31] It is possible that the relationship between adult height and psychological well-being is driven by an omitted variable (or variables).[32] A plausible alternative is that height is directly related to mental health.

The great majority of the previously research on self-esteem of children was conducted in Western individualist societies, and some have questioned its relevance to non-Western countries, especially to China.[33] The main goal of this study were to compare the difference of self-esteem between boys and girls in rural China, and to explore the potential explanatory variables, such as economic status, academic achievement, height, weight, body mass index (BMI), that may associated with self-esteem in different learning phrases.

1 Methods

1.1 Study design and participants

A cross-sectional study was conducted between November and December 2008.The protocol and sampling methodology of this survey have been described previously.[34] The analysis sample comprised of 4th-to 10th- grade 3,344 rural Children (1668 boys and 1676 girls) aged between 10 to 16 years. According to the local economic development and the concentration of migrant workers population, the Henan and Shaanxi provinces were chosen as study sites and nine schools were randomly selected from the two areas.

1.2 Instruments and procedure

The individual level of self-esteem was measured using the Rosenberg Self-esteem Scale (RSES). The RSES consists of 10 statements dealing with a persons general beliefs about himself or herself. Each item is answered on a four-point scale, from strongly agree to strongly disagree, with five items being reverse scored so that a higher score indicates higher self-esteem. The score ob-tained with the scale may vary from 10 to 40, calculated through the sum of the scores obtained from the answers given to the 10 statements. Each statement may receive a score from 1 to 4. A satisfactory self-esteem is defined as higher or equals to 30 at the Rosenbergs Scale, or dissatisfactory with a score lower than 30.[35]

The heights and weights of the participants were consistently measured one by one outside of the classroom by trained interviewers with universal measurement. Height was measured using the portable rigid stadiometer, which measures to the nearest 1mm to a height of 207 cm; weight was measured using digital scales which were regularly calibrated and shown to be accurate within 20 g. Investigation of anthropometric reliability found no evidence of systematic bias for intra-rater or inter-rater comparisons. BMI was calculated (weight (kg)/height (m)2). In addition, height, weight and BMI were transformed to standardized (Z) scores based on gender and exact age, using the LMS method and the Centers for Disease Control and Prevention 2000 Growth Chart data, and were divided into three levels (Z-score: less than -1, -1 to 1 and more than 1).

The data of economic status were collected by question to students of participants and phrased as: how is your family economic status?, and response choices range from very rich to very poor on a five point scale. Considering the sample size distribution (few students chose very rich), we re-divided the options into three levels comprised of top-level (very rich and rich), medium-level and low-level (poor and very poor) during data analysis. Similar to economic status, the data of academic achievement were divided into three levels as above.

1.3 Statistical analysis

Descriptive statistics for all variables were calculated, and comparisons of mean self-esteem scores across age, economic status, academic achievement, weight Z-score, height Z-score and BMI Z-score between boys and girls were made, ANOVA and Scheffes test were used for multiple comparisons among groups with unequal sample sizes, and T-test was used to compare the difference of RSE scores between girls and boys.

Binomial regression with a logit link was then used for the dependent variable self-esteem status (satisfactory/dissatisfactory) to estimate the multivariate odds ratios (OR) of dissatisfactory self-esteem after controlling for other factors. A regression analyses was conducted to compare the impacts on self-esteem among levels of interesting variables by the regression coefficients. All analyses were completed using Stata statistical software (Stata version 12.0; Stata Corp LP, College Station, Tex).

All statistical tests were 2-tailed and significance was set at P <0.05.

2 Results

The means and standard deviations (SD) of RSE scores for all subgroups, categorized according to gender were presented. The overall mean RSE score for girls was slightly higher than that of boys (girls: 30.245.07; boys: 29.795.04) in rural Chinese children, and the scores were slightly higher for girls than for boys at almost each age between 10 to 16 years. In addition, there were significant differences of mean scores among levels of characteristics include economic status in boys, academic achievement in girls and boys and height Z-scores for girls by ANOVA. T test was performed to compare the difference of mean scores in the same level of each characteristic between girls and boys, Table 1.

For regression analyses, RSE scores as a continuous outcome variable and age, economic status, academic achievement, Z-scores of height, weight and BMI were entered on model, and the regression coefficients were presented to compare the amount of impact of independent variables on RSE scores. It can be seen that older age, and weight Z-scores more than 1 could significantly contribute higher RES scores, but high economic status and medium-level academic achievement were just the contrary in boys. Girls with height Z-scores less than 1 and BMI Z-scores more than 1 had significant lower RSE scores (1.31, 1.04 scores decreased compared with average height Z-scores and average BMI Z-scores, P<0.05, respectively), and economic status had no significant impact on that scores. To our surprise, results of regression showed that higher level academic achievement didnt resulted in higher RSE scores in girls and boys, Table 2.

In multivariate analyses, using self-esteem as a binary variable according to the cutoff of the RSE score, results showed that older age was a protective factor of dissatisfactory self-esteem in boys and girls after controlling for other factors. Dissatisfactory self-esteem was significantly associated with medium level of academic achievement compared with low level of that (boys: OR=1.49, 95% CI 1.13-1.97; girls: OR=2.32, 95% CI 1.75-3.08). Dissatisfactory self-esteem was also significantly associated with the height Z-scores less than -1 compared with normal height (the height Z-scores more than -1 and less than 1) in girls (OR=1.69, 95% CI 1.19-2.38, P=0.003), but no significant association in boys.

Figure 1, 2, 3 presented the changes of self-esteem scores with age by different levels of Z-scores height, weight and BMI in boys and girls. The figures suggested significantly decreased scores of self-esteem in the boys

with the height Z-scores less than -1 compared with boys with the height Z-scores more than -1 after the age of 13, and it also can be seen that lower height Z-scores, lower self-esteem scores in girls between ages of 10 to 16. Similarly, the decreases of RSE scores for weight appeared at the years of age 12 and 16 for boys, and at the years of age 10,13 and 16 for girls compared with the same two levels.
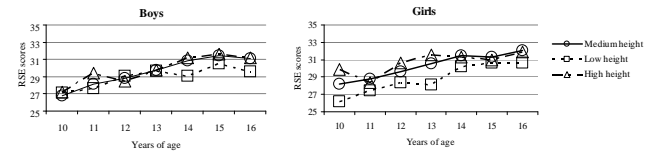
Figure 1. Mean level of self-esteem by Z-scores of height for boys and girls across the years of age
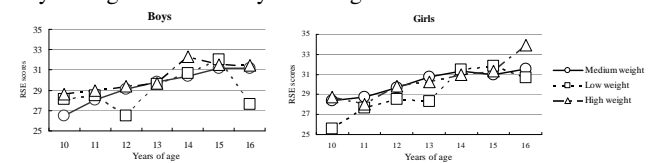
Figure 2. Mean level of self-esteem by Z-scores of weight for boys and girls across the years of age
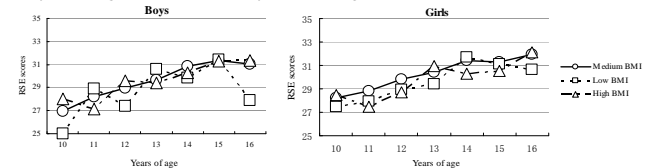
Figure 3. Mean level of self-esteem by Z-scores of BMI for boys and girls across the years of age

3 Discussion

We examined the association between self-esteem and economic status, academic achievement, height, weight and BMI in rural school-aged children in China. In this study, we found that the RSE scores of girls were slightly higher than that of boys in rural China. Low socioeconomic status had been reported to be a risk factor of low self-esteem, but our findings suggested that only the self-esteem scores of boys were associated with SES, and there was no significant difference for prevalence rate of dissatisfactory self-esteem among different economic status in boys. In addition, the self-esteem was not associated with SES in girls. The reason for this result may lie in the fact that theres only a marginal difference among economic status especially in rural China.

Although prior studies had demonstrated that only a modest correlation was discovered between general self-esteem and academic achievement, despite popular beliefs that high self-esteem facilitates academic achievement,[36] we found a unpredictable result that higher aca-

Table 1. Means and Standard Deviations of Self-Esteem Scores According Gender

	Boys						Girls					
	Grade 3 to 6		Grade 7 to 9		Grade 10 to 12			Grade 3 to 6		Grade 7 to 9		Grade 10 to 12	
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	F value	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	F value
Economic status													
Rich	64	28.45 -4.52	33	32.48 -5.26	4	31.8 -7.79	7.68**	43	29.45 -5.07	22	30.22 -4.68	3	32 -4.87	0.48
Moderate	454	28.51 -4.72	637	30.89 -4.95	110	31.97 -4.96	40.74**	484	28.54 -4.56	615	31.44 -4.69	103	30.35 -5.35	51.79**
Poor	240	27.47 -4.76	296	30.37 -4.79	122	32.09 -4.92	43.61**	273	28.42 -4.66	301	31.01 -4.98	101	31.47 -4.34	26.62**
F value		3.94*		3.2*		0.02			0.93		1.36		45.16**	
Academic achievement													
Top Level	165	28.76 -4.86	210	30.67 -4.82	52	32.48 -4.47	14.33**	157	29.68 -4.58	205	32.17 -4.19	47	32.32 -4.43	16.13**
Medium Level	245	27.41 -4.43	293	29.74 -4.7	96	31.93 -4.86	37.16**	268	27.45 -4.45	285	30 -4.3	88	30.62 -4.67	29.84**
Low Level	342	28.47 -4.83	462	31.52 -4.99	88	31.86 -5.37	41.4**	372	28.87 -4.63	448	31.67 -5.17	71	30.57 -5.08	32.7**
F value		3.56*		8.94**		0.28			9.1**		15.64**		38.13**	
Height Z-score													
Less than -1	124	28.54 -4.87	125	29.7 -5.05	14	30.74 -4.92	2.41	122	27.43 -3.95	118	30.37 -4.53	29	29.27 -4.79	14.12**
-1 to 1	538	28.06 -4.73	683	30.97 -4.99	182	32.05 -4.9	71.97**	569	28.71 -4.71	667	31.36 -4.77	139	31.65 -6.89	48.93**
More than 1	96	28.38 -4.62	158	30.86 -4.42	40	32.38 -5.29	13.56**	109	28.95 -4.72	153	31.6 -5	40	30.98 -4.36	9.75**
F value		0.61		3.54*		0.57			4.37*		2.55		1.79	
Weight Z-score													
Less than -1	122	27.43 -3.95	118	30.37 -4.53	29	29.27 -4.79	9.09**	107	27.9 -4.18	137	31.08 -4.53	27	30.04 -4.47	15.87**
-1 to 1	569	28.71 -4.71	667	31.36 -4.77	139	31.65 -6.89	63.83**	595	28.69 -4.65	654	31.3 -4.78	149	30.81 -5.05	48.62**
More than 1	109	28.95 -4.72	153	31.6 -5	40	30.98 -4.36	11.91**	98	28.39 -4.89	147	31.34 -5.05	32	33.93 -10.58	13.14**
F value		0.7		0.94		0.79			1.4		0.14		3.9*	
BMI Z-score													
Less than -1	96	27.81 -4.46	106	30.72 -5.08	26	31.97 -5.74	12.14**	101	28.61 -4.54	130	31.1 -4.91	31	30.43 -4.38	8.01**
-1 to 1	578	28.24 -4.77	728	30.82 -4.87	175	32.08 -4.92	64.82**	596	28.6 -4.55	662	31.44 -4.7	148	31.09 -5.07	60.41**
More than 1	84	28.17 -4.86	132	30.65 -5.12	35	31.82 -4.71	9.13**	103	28.15 -5.12	146	30.7 -5.02	29	32.55 -11.4	8.44**
F value		0.35		0.08		0.04			0.44		1.53		0.94	

* $P<0.05$; ** $P<0.001$

Table 2. Summary of Multiple Regression Analyses Predicting Self-Esteem in Girls and Boys

	Model 1		Model 2		Model 3		Model 4	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
	β		β		β		β	
Grade	0.3176	0.246	0.3144	0.241	0.314	0.241	0.3142	0.241
Economic status	-0.08	0.201	-0.078	0.202	-0.077	0.203	-0.076	0.203
Academic achievements	-0.031	0.045	-0.031	0.043	-0.031	0.043	-0.031	0.044
Height			0.0355	0.089	0.021	0.111	-0.051	0.091
Weight					0.02	-0.037	0.1409	-0.003
BMI							-0.087	-0.028
R^2	0.1021	0.122	0.1034	0.13	0.104	0.131	0.1038	0.131
$\triangle R^2$			0.0013	0.008	1E-04	9E-04	0.0003	0
F	74.22	89.83	56.4	72.36	45.19	58.32	37.72	48.59

demic achievement didnt contribute higher RSE scores in rural China. The cause may be include: 1) The high cost of Higher Education to poor people in China. 2) Nowadays, college students' low employment becomes an undisputable reality in China. 3) Going to college didnt necessarily bring about a dramatic transformation in the quality of life for poor people in China. These notions may change the learning attitude and motivation of children in rural China, and a good school performance is not still an important learning target for them. Moreover, this result was supported by previous studies. For example, Crocker and Major found that stigmatized groups may compare their outcomes with those of the in-group, rather than with the relatively advantaged out-group,[37] and an other study found that children with low self-esteem seem to focus on self-protection; rather than trying to achieve gains for their self-esteem, they try to avoid losses.[38]

A number of previous studies had explored the relationship between body image (height, weight, BMI) and self-esteem in adolescent[39–41] and had produced conflicting results.[42, 43] Previous studies had found that taller adults tend to enjoy better mental health than their counter parts of average.[42, 43] Our results showed a lower self-esteem score and a higher prevalence rate of dissatisfactory self-esteem in girls with lower height Z-score, but there was no significant difference of self-esteem scores among different height Z-scores in boys. This results may be explained as follows: 1) Body image may be affected and partly determined by cultural beliefs and values regarding beauty and attractiveness. 2) Girls who express greater dissatisfaction with their height and body shape tend to have lower self-esteem scores than girls who have a healthier body image.[44, 45] 3) The greater body dissatisfaction (discrepancy between current and ideal figures) displayed by adult females has since been replicated in adolescents. 4) Body shape satisfaction and self-esteem mbe significantly and more strongly related in females than males. Previous study about height and adolescent psychological well-being

found that one percentile point increase in height is associated with only a 0.006−0.007 increase in RSE scores among American male students aged 12 to 19 years,[46] and this result was consistent with ours. In addition, a large amount of previous studies has demonstrated that overweight or obesity was a risk factor of low self-esteem,[47] but we found the factors of weight and BMI were not significantly associated with self-esteem in our findings. The reason might be derived from the difference of the investigated population. In our study, only 2.78% (93/3344) of participants were obesity (BMI Z-scores2), and the prevalence rate of obesity was much lower than that in urban China or developed countries.

It was easy to understand that the years of age when self-esteem was influenced by the height, weight and BMI was was earlier for girls than boys because of early puberty in girls than boys.

Further elucidation of the mechanisms through which characteristics related self-esteem will be necessary to guide families, clinicians, and public health workers in their efforts to preserve healthy self-esteem levels during adolescence and ensure a successful transition to adulthood, especially in China.

Acknowledgement

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