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ORIGINAL PAPER

The rural children's loneliness and depression in Henan, China: the mediation effect of self-concept

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Abstract

Objective This research explored the relationship among loneliness, depression and self-concept of rural children in China.
Methods Seven hundred and twenty-four children (M_{age} = 9.15 years) from two rural primary schools were selected as respondents to participate in this study. Piers-Harris Children's Self-concept Scale, Asher Loneliness Scale and the Center for Epidemiologic Studies Depression Scale for Children were used.
Results Of the rural children surveyed, 14.50% and 10.22%, respectively, experienced strong loneliness and severe depression, and 28.52% had low self-concept. There was a significant positive relationship of moderate level between loneliness and depression, and significant negative relationships between total self-concept and depression, and between total self-concept and loneliness. Moreover, a partial mediation role of self-concept was found in the relationship between loneliness and depression.
Conclusion Children's loneliness was not only directly related to depression, but also was indirectly mediated by self-concept, which demonstrated a partial mediation role in the relationship between loneliness and depression.

Keywords Loneliness · Depression · Self-concept · Mediation effect · Rural children

Introduction

Loneliness is often associated with poor physical and mental health problems [1]. Depression is one of the most common mental health problems associated with loneliness, and persistent loneliness can set the stage for depression [2]. Loneliness and depression are two kinds of negative mood states experienced by children in social interactions. The previous studies have shown that 10–16% of school-age children had severe loneliness [3]. Although loneliness and depression exhibit different performance at different stages of life, the relationship between them is always at a moderately positive level [4, 5]. In addition, the relationship between loneliness and depression is relatively complicated, and the causality between them is still unresolved.

Children's loneliness is a kind of self-awareness of children's interaction with their peers, which is a negative emotional reaction. The long-term loneliness of children is typically associated with depression and sense of failure, and severe loneliness can affect the mental health of children, further leading to depression, anxiety, aggression, disruptive behavior and even alcoholism, obesity and suicide [6]. Moreover, the emergence of loneliness is often closely related to the environment in which children are raised (e.g., social environment and family environment), social relationships, children's personality and cognitive factors. Jones, Carpenter and Quitana (1985) argued that loneliness was influenced by the lack of social skills (e.g., lack of confidence and self-affirmation), excitation and conflicting of emotions (e.g., depression, anxiety and neuroticism), negative attitudes (e.g., hostility, life, and social pessimism) and low self-esteem (e.g., low self-concept) [7].

Childhood is a critical period for the development of self-concept, and self-concept is considered as an important psychological attribute. Specifically, self-concept is defined as relatively stable self-schemata which are generalized to refer to an individual's view of him- or herself across different situations [8]. Self-concept not only controls and integrates

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the individual's awareness of environmental perception, but also determines the individual's behavioral response to the environment [9]. Moreover, self-concept is thought to be associated with mental health. A fair number of prior studies have demonstrated the importance of self-concept for children's psychological growth [10, 11]. Some researchers have found a strong relationship between self-concept and loneliness [12]. Lower self-concept contributes to higher loneliness, while decreasing the loneliness can be helpful in increasing the self-concept [13]. Additionally, self-concept and self-esteem have a momentous role on anxiety and depression, and a significant negative relationship exists between self-concept and depression [14]. Thus, as an important individual variable, self-concept may play an important role between depression and loneliness. However, through a comprehensive review of the existing literature, one may find that few studies have focused on loneliness, depression, self-concept and their interrelations, especially for rural children.

In China, the rural population accounts for nearly 70% of the total population, and the rural children are a very large and noteworthy group. Especially, with the development of society and economy, the number of migrant workers who work far away from home to city in rural areas is increasing year by year. Thus, the mental health of children in rural areas deserves our special attention and penetrating research. The primary objective of this study is to examine the associations among loneliness, depression and self-concept for rural children in China, and investigate the mediation effect of self-concept on loneliness and depression in an effort to explore the intrinsic mechanism among them. The expected results are (1) loneliness of children will be positively related to their depression; whereas there are negative correlations between loneliness and self-concept, and between depression and self-concept; (2) self-concept plays a mediation role in the relationship between loneliness and depression. This study provides a scientific evidence for improving children's self-concept levels to reduce the impact of loneliness on children's mental health.

Methods

Participants

The study used a whole group sampling method to randomly draw two ordinary rural primary schools from Henan province, China. The data collected from 724 students (male: 431; female: 293) aged from 6 to 14 years old were used for ensuing analysis after precluding the unqualified questionnaire. The average age of the students was 9.15 ± 1.79, and the majority of students (99.58%) belonged to the Han ethnic group. These students came from all six grades in primary school, with 23.76% of them ($n = 172$) being from Grade 1, 17.82% ($n = 129$) from Grade 2, 19.48% ($n = 141$) from Grade 3, 17.96% ($n = 130$) from Grade 4, 7.32% ($n = 53$) from Grade 5, and 13.67% ($n = 99$) from Grade 6, respectively. Ethical approval for this study was granted by the Ethics Committee of National Research Institute for Family Planning, Beijing, China. All students volunteered to participate in this study and signed statements of their informed consent. Note that permission for the questionnaire survey was granted by the school principals and teachers, and the class teachers filled in the statements of informed consent on behalf of the Grade 1 and Grade 2 students.

Measures

This study adopted the method of collective measurement in the classroom. The examiners were composed of professionally trained postgraduate students with psychology major. When the questionnaire survey was conducted, the examiners were required to explain the requirement and instruction of questionnaire, and give some personal guidance if necessary to ensure that the participants could correctly understand the questionnaire. It is worth noting that the examiners were required to read each item of questionnaire one by one for the Grade 1 and Grade 2 students due to their limited literacy levels, and ask them to fill out the questionnaire according to their own understanding. In addition, due to the relatively poor self-management skills of students in Grades 1 and 2, a full-time teacher was assigned to each class to help maintain discipline. At the beginning of the questionnaire, basic information of the participants (e.g., age, gender, ethnicity, grade, class, etc.) was collected. The total time spent on the survey was approximately 15–20 min. The scales used here were briefly described as follows:

Piers-Harris Children's Self-concept Scale (PHCSS)

The revised Chinese version of PHCSS was employed in this study to measure the students' self-concepts [15]. The scale consists of 80 items (40 items are positive and the other 40 items are negative), with answer of "yes" or "no" to each item. PHCSS includes six sub-scales measuring behavior, intellectual and school status, physical appearance and attributes, anxiety, popularity, happiness and satisfaction, respectively. The total score of the scale ranges from 0 to 80, and higher score indicates better self-concept. The two cut points for classifying the subjects into low loneliness, general loneliness and high loneliness are 46 and 58, respectively [15]. The revised Chinese version of PHCSS was widely used in China, and it had relatively high reliability and validity. Specifically, the alpha coefficient was from 0.61(on "popularity" subscale) to 0.75 (on "behavior" subscale), and the internal consistency of each factor was

satisfactory [16]. Using the present data, the Cronbach's alpha coefficient ranged from 0.60 (on "popularity" subscale) to 0.77 (on "physical appearance and attributes" subscale).

Asher Loneliness Scale (ALS)

This scale was designed by Asher et al. (1984) and revised by Liu (1999) according to the Chinese situation [3, 17]. The ALS consists of 24 items endorsed on a five-point scale indicating how true each item is for the students, of which 16 items focus on the feeling of loneliness, social adequacy, and subjective estimation of peer status. Besides, the remaining eight items that inquire about the participants' hobbies serve as supplement. According to the classification method of Asher et al. [3], loneliness could be divided into three categories according to standardized scores: general loneliness ($-1 \leq$ Z-score ≤ 1), low loneliness (Z-score < -1) and high loneliness (Z-score > 1). Note that Z-score > 2 indicated severe loneliness. The Cronbach's alpha coefficient was 0.90 in the study of Liu [17], whereas the Cronbach's alpha coefficient was 0.81 in the present study.

The Center for Epidemiologic Studies Depression Scale for Children (CES-DC)

The CES-DC scale is composed of 20 items, which is a widely used instrument for screening and measuring depression of children [18]. The Chinese version of CES-DC revised by the center for epidemiologic of China was utilized in this study. This scale measures six aspects: depression mood, guilt and unworthiness, helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disorders. Students' responses to the items are scored using a 4-point Likert scale (0 = no, not like me, 1 = yes, a bit like me, 2 = yes, most of the time, 3 = yes, very much like me). Total score ranges from 0 to 60, and higher score implies higher levels of depression. Note that, scores less than or equal to 9, scores from 10 to 15, scores from 16 to 24, and scores more than 24 are categorized as none, mild, moderate and severe levels of depression, respectively. The CES-DC has been used in both clinical and community environment. The internal consistency coefficients of the Chinese version for the test and retest were 0.82 and 0.85 [19], respectively. Based on the collected data, the Cronbach's alpha coefficient was calculated to be 0.91 here.

Statistical analysis

SPSS 20.0 software was used for data entry, data cleaning, and statistical analysis. Some statistical methods such as descriptive analysis, *t* test, ANOVA, and mediation effect test were employed to analyze the collected data. To be specific, the distributions of loneliness, depression and self-concept were obtained via the descriptive analysis, and the differential analysis was conducted using *t* test and ANOVA under different genders (boy and girl) and grades (grades 1 through 6). In addition, the relationship among loneliness, depression, and self-concept was investigated using correlation analysis, and the mediation effect of self-concept in the relationship between loneliness and depression was explored using the testing procedure of mediation effect.

Results

Distributions of loneliness, depression and self-concept

Table 1 presents the frequencies and percentages of loneliness, depression and self-concept, respectively. The results showed that the majority of rural children (i.e., 73.48%) had moderate loneliness, 12.02% of children showed low loneliness, and 14.50% of children exhibited high loneliness feeling including 4.14% children with severe loneliness. The results of depression scores indicated that more than half of the rural children were not screened for depression, while about 10% of children were screened for moderate and severe depression, respectively. Additionally, for the self-concept, it was found from Table 1 that 71.48% of children exhibited moderate-to-high self-concept, while the remaining 28.52% of children had low self-concept.

Table 2 summarizes the mean scores and standard deviations of loneliness, depression, and self-concept with varying genders and grades. The results indicated that there were no significant differences in loneliness, depression, and

Table 1 Frequencies and percentages of loneliness, depression and self-concept

Categories	Frequency	Percentage (%)
Loneliness		
High	105	14.50
General	532	73.48
Low	87	12.02
Depression[a]		
None	344	58.60
Mild	122	20.78
Moderate	61	10.39
Severe	60	10.22
Self-concept[a]		
Moderate	257	44.16
High	159	27.32
Low	166	28.52

[a]Variables with missing data

Table 2 Differential analysis of the three variables under different genders and grades

	Loneliness		Depression[a]		Self-concept[a]		Behavior[a]		Intellectual and school status[a]		Physical appearance and attributes[a]		Anxiety[a]		Popularity[a]		Happiness and satisfaction[a]	
	N	M ± SD	*N*	M ± SD	*N*	M ± SD	*N*	M ± SD	*N*	M ± SD	*N*	M ± SD	*N*	M ± SD	*N*	M ± SD	*N*	M ± SD
Gender	724		587		582		675		675		684		679		692		687	
Boy	431	29.40 ± 9.37	345	10.47 ± 8.94	334	58.35 ± 10.45	398	12.66 ± 2.54	398	11.22 ± 3.28	401	7.78 ± 3.08	399	8.89 ± 2.19	408	8.48 ± 1.73	407	7.86 ± 1.67
Girl	293	28.83 ± 9.09	242	11.03 ± 10.94	248	59.47 ± 11.04	277	13.33 ± 2.21	277	11.15 ± 3.62	283	7.39 ± 3.24	280	8.90 ± 2.33	284	9.29 ± 1.74	280	7.91 ± 1.82
T	0.82		−0.68		−1.25		−3.58***		0.26		1.63		−0.05		−6.03***		−0.44	
Grade	724		587		582		675		666		684		679		692		687	
Grade one	172	29.08 ± 8.59	142	9.32 ± 8.84	129	62.40 ± 9.76	159	13.31 ± 2.30	154	12.82 ± 2.94	154	9.25 ± 2.83	153	9.41 ± 2.06	159	8.69 ± 1.79	158	7.98 ± 1.73
Grade two	129	26.91 ± 9.36	108	8.68 ± 7.12	95	64.14 ± 6.65	116	12.97 ± 1.84	120	12.37 ± 2.46	121	9.11 ± 2.41	118	9.56 ± 1.59	125	8.95 ± 1.56	120	8.24 ± 1.35
Grade three	141	32.37 ± 9.16	111	13.29 ± 10.46	125	54.44 ± 10.97	134	12.29 ± 2.65	132	9.89 ± 3.34	137	5.99 ± 2.92	137	8.27 ± 2.40	137	8.66 ± 1.77	139	7.48 ± 2.09
Grade four	130	29.55 ± 9.64	108	10.26 ± 10.80	109	56.22 ± 11.23	124	12.93 ± 2.62	120	9.89 ± 3.83	127	6.59 ± 3.07	127	8.76 ± 2.43	127	8.87 ± 1.89	126	7.72 ± 1.70
Grade five	53	30.52 ± 8.50	37	13.46 ± 11.79	42	57.69 ± 8.23	48	12.77 ± 2.31	47	9.97 ± 3.09	50	6.56 ± 3.00	49	8.91 ± 2.19	49	8.69 ± 1.83	51	7.94 ± 1.45
Grade six	99	26.51 ± 8.86	81	11.60 ± 10.38	82	57.76 ± 11.82	94	13.24 ± 2.58	93	11.09 ± 3.32	95	7.27 ± 2.97	95	8.32 ± 2.42	95	9.05 ± 1.81	93	8.00 ± 1.66
F	7.09***		3.89***		14.89***		3.02*		21.08***		30.40***		7.42***		0.92		2.99*	

$p < 0.05$; ***$p < 0.001$

[a]Variables with missing data

self-concept between different genders, but significant differences among different grades ($p < 0.001$). To be specific, the scores of loneliness and depression from the third and fifth grades were higher than those from the other grades, and the post-hoc analysis of the grade differences was shown in Table 3.

The differential analysis regarding the sub-dimensions of self-concept showed that there were no differences in other dimensions except for behavior and popularity ($t = -3.58$, $t = -6.03$, $p < 0.001$) between boys and girls. Moreover, the significant differences were found in behavior ($F = 3.02$, $p < 0.05$), intellectual and school status ($F = 21.09$, $p < 0.001$), physical appearance and attributes ($F = 30.40$, $p < 0.001$), anxiety ($F = 7.42$, $p < 0.001$), and happiness and satisfaction ($F = 2.99$, $p < 0.05$) except for *popularity* ($F = 0.92$, $p > 0.05$) among different grades (see Table 2).

The correlation among loneliness, depression and self-concept

Table 4 provides the results regarding the correlations among loneliness, depression, total self-concept and its sub-dimensions (i.e., behavior, intellectual and school status, physical appearance and attributes, anxiety, popularity, and happiness and satisfaction). The results from Table 4 showed that there was a significant positive relationship of moderate level between loneliness and depression ($r = 0.492$, $p < 0.01$), and significant negative relationships were found between total self-concept and depression ($r = -0.561$, $p < 0.01$), and between total self-concept and loneliness ($r = -0.579$, $p < 0.01$). Additionally, the significant negative relationships between each sub-dimension of self-concept and loneliness or depression were also found ($p < 0.01$).

The mediation role of self-concept in the relationship between loneliness and depression

According to the testing procedure of mediation effect summarized by Wen et al. [20], the first step was to test the equation "$Y_{\text{depression}} = cX_{\text{loneliness}} + e_1$" to examine the effect of loneliness on depression (H_0: $c = 0$). The results were observed from Table 5 that loneliness could explain 24.1% of the variance in depression, and a significant relationship was detected ($c = \beta = 0.492$, $F = 187.712$, $p = 0.000$), indicating that the predict effect of loneliness on depression was significant. The second step was to sequentially test the equations "$M_{\text{self-concept}} = aX_{\text{loneliness}} + e_2$" and "$Y_{\text{depression}} = bM_{\text{self-concept}} + e_3$" to examine the effect of loneliness on self-concept (H_0: $a = 0$) and the effect of self-concept on depression (H_0: $b = 0$), respectively. The standard regression coefficients (βs) for the above two tests were -0.579 ($p = 0.000$) and -0.561 ($p = 0.000$), respectively, implying that the mediation effect was significant. The third step was to test the equation "$Y_{\text{depression}} = c'X_{\text{loneliness}} + b'M_{\text{self-concept}} + e_4$" with a goal to test whether the partial mediation effect (PME) or the full mediation effect (FME) is significant. According to Judd and Kenny [21], PME is significant if c' is significant and FME is significant otherwise. The results for the third step showed that c' was 0.274 ($p = 0.000$), which indicated that self-concept had a partial mediation role in the relationship between loneliness and depression. Finally, the effect size of the partial mediation effect could be calculated via $a \times b'/c = (-0.579) \times (-0.396)/0.492 = 0.466$, and the mediation effect explained 34.5% of the variance in depression ($\sqrt{0.360 - 0.241} = 0.345$, where 0.360 and 0.241 were the adjusted R^2 values for the first step and third step, respectively).

Discussion

This study aims to investigate the current situation of the rural children's loneliness, depression and self-concept in Henan, China, and to explore the relationship among loneliness, depression and self-concept. The results showed that although most rural children's loneliness levels were low, 14.50% of children experienced a strong sense of loneliness including 4.14% children with severe loneliness. These findings were roughly consistent with the results from previous study, which reported that the rate of high loneliness among pupils was 19%, and the rate of severe loneliness was 9% in China [22]. As is known to all, high level of loneliness among children is not beneficial to their healthy development, and may cause negative emotions such as depression and anxiety. Therefore, parents and teachers should pay particular attention to children with high level of loneliness.

The present study did not find the significant differences in loneliness between different genders, but among different grades. The results indicated that children in both grade three and grade five had relatively higher level of loneliness, of which the loneliness scores of grade three were higher than those of the other grades. Although prior studies had no definite conclusion about the differences in loneliness among different grades, some of them still supported the results of the current study [22, 23]. Parkhurst and Hopmeyer [24] proposed a model of loneliness development based on the integration of children's social needs and social cognitive development, and indicated that the development of individual loneliness included five stages from early childhood to late adolescence. They thought that the third stage occurred in the middle of the primary school and the fourth stage occurred from the senior grades of primary school to the junior high school. Grade three is in the transitional stage between low grades and senior grades of primary school. At this stage, whether or not to integrate into the peer group is

Table 3 Results for post-hoc analysis

Dependent variable	(I) Grade	(J) Grade	Mean difference (I–J)	Std. error	Sig.	95% confidence interval	
						Lower bound	Upper bound
Loneliness	1	2	2.17*	1.05	0.041	0.09	4.24
	1	3	−3.29*	1.03	0.001	−5.31	−1.26
	1	4	−0.47	1.05	0.657	−2.54	1.60
	1	5	−1.44	1.42	0.313	−4.23	1.36
	1	6	2.57	1.14	0.025	0.33	4.82
	2	3	−5.45*	1.10	0.000	−7.62	−3.29
	2	4	−2.64*	1.13	0.020	−4.85	−0.42
	2	5	−3.60*	1.48	0.015	−6.51	−0.69
	2	6	0.40	1.21	0.738	−1.97	2.78
	3	4	2.82*	1.10	0.011	0.65	4.98
	3	5	1.85	1.46	0.206	−1.02	4.72
	3	6	5.86*	1.19	0.000	3.52	8.19
	4	5	−0.97	1.48	0.512	−3.87	1.93
	4	6	3.04*	1.21	0.012	0.67	5.41
	5	6	4.01*	1.54	0.010	0.98	7.04
Depression	1	2	0.63	1.24	0.610	−1.79	3.06
	1	3	−3.97*	1.23	0.001	−6.38	−1.56
	1	4	−0.94	1.24	0.446	−3.37	1.49
	1	5	−4.14*	1.79	0.021	−7.65	−0.63
	1	6	−2.29	1.35	0.090	−4.94	0.36
	2	3	−4.60*	1.31	0.000	−7.17	−2.03
	2	4	−1.57	1.32	0.23	−4.16	1.01
	2	5	−4.77*	1.85	0.10	−8.39	−1.15
	2	6	−2.92*	1.42	0.041	−5.72	−0.12
	3	4	−3.03*	1.31	0.021	0.46	5.60
	3	5	−0.17	1.85	0.926	−3.78	3.44
	3	6	1.68	1.42	0.235	−1.09	4.46
	4	5	−3.20	1.85	0.083	−6.82	0.42
	4	6	−1.35	1.42	0.345	−4.14	1.45
	5	6	1.85	1.92	0.335	−1.92	5.63
Self-concept	1	2	−1.73	1.37	0.206	−4.42	0.95
	1	3	7.96*	1.27	0.000	5.47	10.46
	1	4	6.18*	1.32	0.000	3.59	8.77
	1	5	4.71*	1.79	0.009	1.18	8.24
	1	6	4.65*	1.43	0.001	1.84	7.45
	2	3	9.69*	1.38	0.000	6.99	12.40
	2	4	7.92*	1.42	0.000	5.13	10.71
	2	5	6.45*	1.87	0.001	2.76	10.13
	2	6	6.38*	1.53	0.000	3.38	9.38
	3	4	−1.78	1.33	0.180	−4.38	0.82
	3	5	−3.25	1.80	0.072	−6.79	0.29
	3	6	−3.32*	1.44	0.021	−6.14	−0.49
	4	5	−1.47	1.84	0.424	−5.08	2.14
	4	6	−1.54	1.48	0.300	−4.44	1.37
	5	6	−0.06	1.92	0.973	−3.84	3.71

*The mean difference is significant at the 0.05 level

Table 4 Relationship among loneliness, depression and self-concept

	Loneliness	Total self-concept	Behavior	Intellectual and school status	Physical appearance and attributes	Anxiety	Popularity	Happiness and satisfaction
Depression	0.492**	−0.561**	−0.448**	−0.360**	−0.304**	−0.464**	−0.404**	−0.447**
Loneliness		−0.579**	−0.467**	−0.431**	−0.427**	−0.388**	−0.511**	−0.474**

**$p < 0.01$

Table 5 Mediation role of self-concept in the relationship between loneliness and depression

Variables	B	Standard Error	β	R^2	Adjusted R^2	t	F
Step 1							
Loneliness	0.529	0.039	0.492	0.242	0.241	13.701***	187.712***
Step 2 (1)							
Loneliness	−0.692	0.040	−0.579	0.336	0.335	−17.125***	293.253***
Step 2 (2)							
Self-concept	−0.527	0.035	−0.561	0.315	0.314	−15.086***	227.595***
Step 3							
Loneliness	0.304	0.050	0.274	0.363	0.360	6.076***	140.510***

B unstandardized coefficients, β standardized coefficients

***$p < 0.001$. Predicted variable: step 1, depression; step 2(1), self-concept; step 2(2), depression; step 3, depression

the determining factor of children's loneliness [24]. However, according to Eriksson's theory, at this transitional stage the psychosocial development of children in all aspects is mature and semi-mature; children's emotional processing and social interaction abilities are not mature enough to deal with the complicated peer relationships, which will inevitably increase the incidence of loneliness. Grade five is in the upper grade of primary school. At this stage, children are more concerned about their popularity and social support status in the group, and these two factors are the key factors affecting children's loneliness [24].

In addition, this study also found that about 40% of the rural children were screened for depression, of which 10.22% were reported to have severe depression, and 10.39% had moderate depression. The previous study had shown that the detectable rate of depression in Chinese children was 33.90%, and the incidence of depression symptoms increased with age in both primary and secondary schools [25]. However, the present study did not find a tendency for depression to increase with grade, but showed that the depression levels of children in grades three and five were relatively higher than those of children in other grades. Note that the scores of loneliness discussed above had a similar trend, which actually indirectly demonstrated that there was a close relationship between depression and loneliness among rural children. Prior studies also evidenced this conclusion [26, 27]. Meng [28] suggested that the increase of loneliness easily induced depression, and on the contrary, long-term depression would aggravate the feeling of loneliness. Additionally, the results of this study indicated that 28.52% of rural children had low level of self-concept, and there were significant gender differences in behavior and popularity dimensions and grade differences in other dimensions. This might be related to the dynamics and instability of children's psychosocial development and the immature self-concept development [29].

Moreover, the current study showed that loneliness was closely associated with depression and self-concept. The higher the level of loneliness in rural children is, the higher the level of depression is; and higher level of self-concept implies lower level of depression. These results were also consistent with the previous studies [28, 30]. The results from this study also showed that children's loneliness not only was directly related to depression, but also was indirectly mediated by self-concept, which demonstrated a partial mediation role in the relationship between loneliness and depression. We thought that children with high level of loneliness had low level of self-concept and low self-concept could reduce their self-esteem and self-confidence, which resulted in a decrease in children's sense of social belonging and eventually cause depression and anxiety. Children and adolescents begin integrating social identity into their own self-concepts during elementary school by assessing their positions among peers [31]. In this case, teachers and parents should pay more attention to the cultivation and development of children's self-concepts in their education,

and encourage them to establish good peer relationships. On the other hand, parents should also spend more time caring for and accompanying their children, and actively and frequently interact with children to reduce their loneliness and poor mood such as depression.

Naturally, some limitations need to be considered when interpreting the findings from this study. First, the subjects were not formally diagnosed with depression. We only used self-report measures from children themselves, which may have some subjective bias. Therefore, the formal diagnostic methods and parent/teacher reports should be conducted to test the discriminate validity in the future. Second, the subjects of this study were just collected from two schools from Henan province in China, which might limited the generalization of the obtained results. In the future, we will expand the scope of the sampling and further discuss this interesting and valuable research issue. Third, although self-concept is an important factor that can influence children's loneliness and depression, many other influencing factors such as family, society, school, peers and sociometric status, are also momentous factors worth considering in further studies. Last, but not least, another line of research worth considering is exploring the impact of important interventions and trainings on improvement of children's self-concept levels and reduction of their loneliness and depression.

Despite these limitations, the current study promoted a better understanding of the relationship between loneliness and depression of children, and further confirmed the importance of self-concept. Further research should explore how to enhance children's levels of self-concept through training and intervention to reduce their loneliness and depression. In addition, it is valuable to further explore the effects of multiple cognitive factors on the regulation of children's negative emotional experience (i.e., loneliness, depression, anxiety).

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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