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Factors influencing self-concept among adolescents infected with HIV: A cross-sectional survey in China

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Keywords:	adolescents, self-concept, HIV & AIDS < INFECTIOUS DISEASES, influencing factors

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Factors influencing self-concept among adolescents infected with HIV: A cross-sectional survey in China

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Abstract

Purpose

The purpose of this study was to determine the factors influencing self-concept among human immunodeficiency virus (HIV) infected adolescents in China, and to analyze the risk and protective factors.

Methods

A questionnaire was distributed among two groups totaling to 290 adolescents. The Piers-Harris Children's Self-concept Scale, the Perceived Stress Scale, the Perceived Social Support Scale, and the Simplified Coping Style Questionnaire were adapted for a Chinese population. Differences between the groups were tested for significance using the Student's t-test, and ANOVA was used to test continuous variables. The relationship between environmental personality factors and adolescent self-concept

was examined by Pearson correlation analysis. Hierarchical linear regression analysis was used to model the effects of environmental personality factors on self-concept.

Results

The self-concept total score among HIV-infected adolescents was significantly lower than normal adolescents ($p < 0.05$). Hierarchical regression analysis indicated that age ($\beta = -0.19$, $t = -2.16$, $p = 0.03$), perceived stress ($\beta = -0.19$, $t = -2.22$, $p = 0.03$), perceived social support ($\beta = 0.26$, $t = 3.25$, $p = 0.00$), positive coping ($\beta = 0.50$, $t = 5.75$, $p = 0.00$), and negative coping ($\beta = -0.45$, $t = -5.33$, $p = 0.00$) were significantly associated with self-concept total scores.

Conclusions

The self-concept of HIV-infected adolescents is related to perceived stress, perceived social support, and coping style. These findings underline the significance of self-concept among adolescents infected with HIV.

Strengths and limitations of this study

1. This is the first study to determine the factors influencing self-concept among HIV-infected adolescents in China.
2. Although HIV-infected adolescents are a special group, the sample size was suitably powered to allow statistical analysis including hierarchical linear regression.
3. This was a cross-sectional study and thus causal relationships between the self-concept of HIV-infected adolescents and influencing factors require further

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exploration.

Keywords: adolescents; self-concept; HIV; influencing factors

Introduction

Over the years, AIDS has spread throughout the world at an extremely rapid rate. In 1985, AIDS began to prevail in a few African countries. By 2005, AIDS had affected nearly all countries and regions worldwide [1]. As a result of AIDS, the mortality rate of the adult population has increased significantly [2]. The inevitable consequence is that a large number of adolescents lose their parents because of AIDS. The typical socioeconomic status of families and individuals in communities with a high incidence of AIDS means that these orphans have a visible vulnerability in terms of physical, psychological, and social adaptation [3]. At present, the number of adolescents affected by AIDS in China is large and rapidly increasing. Living conditions, social environment, and mental health difficulties are serious problems that have had an enormous impact on the growth and development of adolescents affected by AIDS. A qualitative study in China reported that prejudice and discrimination have a substantial negative impact on the health of adolescents with AIDS. The mental health difficulties experienced by AIDS orphans are mainly due to decrease in self-concept and increase in depression [4-6]. All the difficulties described above impact on self-concept among adolescents with AIDS, and we predict that self-concept in adolescents with AIDS is lower than in healthy adolescents.

Self-concept is a cognitive assessment of one’s own abilities and weaknesses [7] and

plays an important role in mental health. Low levels of self-concept are a risk factor affecting social function, and problems in adolescents, thus resulting in different types of mental health problems. High levels of self-concept are considered to be a protective factor that hinders the development of psychological problems and promotes general health [8-11]. An individual's perception of himself/herself changes significantly during adolescence, or even undergoes a dramatic reversal [12]. In the early stages of puberty, adolescents are more likely to compare themselves with others, and to understand the comparisons and judgment of others to themselves. Adolescents also begin to give higher value to these judgments [13]. Social psychology studies have shown that during and after puberty, children become more self-conscious, more receptive, and more concerned about the opinions of others [14 15]. One developmental psychology study has shown that during and after puberty, an adolescent's self-evaluation becomes more comprehensive and changes from that held previously [16]. Previous studies have shown that specific groups of adolescents may be vulnerable to lower levels of self-concept than found in normal groups. For example, studies of adolescents with chronic diseases have shown that their level of self-concept is significantly lower than healthy adolescents. Adolescents with chronic diseases often feel insecure, lonely, isolated, and controlled by changes resulting from chronic disease[17 18]. Therefore, we suggest that chronic diseases such as AIDS, will have a serious impact on the self-concept of adolescents. To date, no studies have investigated the self-concept of Chinese adolescents with AIDS. In China, adolescents infected with AIDS represent a large but specific group who have experienced

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multiple losses throughout their lives, thus increasing their risk of psychopathology [19]. Therefore, studying the development of self-concept among HIV-infected adolescents, and identifying methods to help them maintain psychological well-being and healthy growth is of clear importance.

The formation and development of self-concept is influenced by many factors. It has been shown that teacher-student relationships, peer relationships, parent-child relationships, parenting patterns, perceived stress, perceived social support, and individual coping styles, are all likely to have an impact on self-concept among adolescents [20]. The current study explored the factors which influence the self-concept of HIV-infected adolescents, focusing on both risk and protective factors, and external environment-individual internal characteristics.

A large amount of research data suggest that factors such as perceived stress and perceived social support in the external environment have a significant impact on the formation and development of self-concept. Perceived stress is the result of the perceptual assessment of an individual's own experience of stress resulting from specific situations or events [21]. People have different perceptions about events that occur, and their psychological response differs. Differences in psychological response will have different effects on mental health. In Africa, the incidence of AIDS is extremely high and adolescents are often in a high-crime and precarious environment. Such an environment may aggravate their sense of pressure, and thus affect their self-concept.

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4 Social support is considered to be an important factor affecting psychological stress
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6 and physical health. From a psychological perspective, Cobb suggests that social
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8 support includes the following: emotional support; respect and support; and member
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10 attribution [22]. Social support can significantly predict the emotional behavior of
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12 adolescents, and higher social support has a protective effect on adolescent mental
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14 health [23]. Researchers have shown that the relationship between social support and
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16 self-concept is stable and positively correlated. There is a difference between social
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18 support factors and the correlation between the fractal dimensions of self-concept.
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20 Social support for adolescents is primarily derived from parents, teachers, classmates,
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22 and friends. Michelle et al. [24] report that the relationship between the frequency of
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24 social support and self-concept is significant. Rubin et al. [25] have shown that social
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26 support may prevent teenagers with LD (learning disabilities) from mood disorders.
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28 LD adolescents who receive more social support from their parents, teachers, and
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30 peers, have higher levels of self-concept than adolescents who receive less social
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32 support [25]. Barroso [26] concluded that social support is an important factor for
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34 adults who are long-term survivors of AIDS. Lack of social support may also cause
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36 adolescents with AIDS to have lower levels of self-concept. Cluver et al. [27] report
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38 that orphans in particular may have a lack of social support due to illness or death of
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40 family members, thereby distorting their cognitions about themselves and others.
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50 An adolescent's self-concept is not only affected by external environmental factors,
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52 but their own internal factors. Individual coping styles and other factors have a
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54 significant impact on the emergence and development of self-concept. Coping style
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refers to the change in cognition and/or or behavior utilized by an individual in a particular stressful situation, with the aim of managing emotions and improving the problem [28]. Individuals adopt specific coping styles and measures according to their own experiences after cognitive assessment of the response process. Coping style has an important impact on the status of an individual's environmental adaptation and mental health [29]. At present, an important research aspect in clinical psychology is the study of the relationship between an individual's coping style, and physical and mental health. Sarah et al. [30] have shown that the clarity of self-awareness or self-concept is related to more active coping behavior. Studies of individuals with AIDS and their coping styles suggest that a high level of active coping is positively related to immunization measures, and may indirectly affect the self-concept of the AIDS patient [31].

This study was designed to explore the factors which influence the self-concept of adolescents with AIDS. We investigated the self-concept of HIV-infected adolescents, considered the environmental and individual levels, and analyzed the relationship between perceived stress, perceived social support, and coping style, and self-concept, in order to better understand the role of self-concept among adolescents with AIDS. We believe this is the first study of this kind.

Methods

Sample size and sampling technique

The current study was conducted in a rural county in Henan province, China, where

many residents were infected with HIV through blood collection using inadequate hygiene techniques. This rural county has the highest prevalence of HIV infection in the area. We obtained village-level HIV surveillance data from the anti-epidemic station in each of the counties to identify the villages with the highest number of AIDS-related deaths and confirmed HIV infections.

A questionnaire was distributed among two groups of adolescents; 140 questionnaires were distributed in the case group (HIV-infected adolescents) and 139 valid questionnaires were returned (response rate of 99.3%). Among the adolescents in the case group, there were 88 boys (63.3%) and 51 girls (36.7%), and the average age was 15.89 ± 2.8 years. The control group (healthy adolescents) was issued 150 questionnaires, and 144 valid questionnaires were returned (response rate of 96.0%). Among the adolescents in the control group, there were 91 boys (63.2%) and 53 girls (36.8%), and the average age was 13.85 ± 1.2 years. The total number of participants in this study was therefore 283 adolescents aged 10–20 years and of Han ethnicity. Participation of the adolescents was voluntary, and all provided informed consent.

Procedure

To recruit adolescents with AIDS, we worked with the town leaders to generate lists of adolescents with confirmed diagnoses of HIV/AIDS. We approached the adolescents on the lists and invited them to participate in the study. After the eligibility of an adolescent was confirmed, the interviewer(s) provided him/her with a detailed description of the study design, potential benefits and risks, confidentiality

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issues and invited him/her to participate. When an adolescent agreed to be included in the study, the parents of the person were invited to participate by means of letters.

HIV-infected adolescents 10–20 years of age (inclusive) comprised the case group. The survey was conducted in the first half of the adolescents who resided in the county. The exclusion criteria were as follows: HIV infection not confirmed; or physical illness which would hinder participation (such as encephalopathy or epilepsy).

The research met ethical guidelines according the to the Declaration of Helsinki, and approval was granted by the Ethics Committee of Harbin Medical University. All participants signed informed consent forms after receiving explanations of the research purpose, meaning, and content. All of the adolescents participated voluntarily.

Measures

Demographic characteristics

Adolescents were asked to report on individual and family characteristics including age, gender, family economic status (i.e., good, moderate, and poor), and family structure (intact/non-intact).

Outcome measures

The Piers-Harris Children's Self-concept Scale is a paper-and-pencil test consisting of 80 items which are scored as true or false. The items are self-descriptive declarative

statements. The scores range from 1–80; higher scores indicate higher levels of self-concept. The statements are worded in both positive and negative language to control for social desirability responding. The scale has good reliability and validity and the Cronbach's alpha of the scale was 0.858 in the current study.

Stress related to interpersonal stressors was assessed by the Perceived Stress Scale. The scale consists of ten items. Each item has a score range of 0–4, with a possible total score of 40 overall. Higher scores indicate higher levels of stress. The internal consistency measured by Cronbach's alpha in this study was 0.847.

The Perceived Social Support Scale (PSSS), developed by Zimet et al. consists of 12 items that were revised from three subscales (family, friend, and other support). Participants responded to the items on a 7-point Likert-type scale indicating disagreement/agreement. Each item was divided into a total score for social support. Items were adjusted to be more appropriate for children affected by AIDS in the current study. The items "leaders, relatives and colleagues" were changed to "teachers, relatives and students. Cronbach's alpha was 0.887 in this study. We used the Simplified Coping Style Questionnaire (SCSQ) to measure coping style. The SCSQ includes 20 items that contain two dimensions of coping (positive and negative). Each dimension consists of 10 items, and each item is scored on a 5-point scale, where 1 indicates 'certainly not' and 5 indicates 'certainly.' A higher score on one dimension indicates that the individual is more likely to utilize this type of coping style. The questionnaire is highly reliable and suitable for a Chinese population. The Cronbach's alpha for the two independent dimensions of coping were 0.70 and 0.69.

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Data analysis

The Statistical Package for Social Sciences 19.0 (SPSS 19.0) program (IBM, Armonk, NY, USA) was used for statistical analysis. All tests were two-tailed and the significance level was set at a $p < 0.05$. Differences between the groups were tested using the Student's t-test and ANOVA was used to test continuous variables. The relationship between environmental personality factors and adolescent self-concept was examined with Pearson correlation analyses. Hierarchical linear regression analysis was used to model the effects of environmental personality factors on self-concept in adolescents. In the regression model, gender, age, family economic status, and family structure were entered in the first block to control for potential confounding variables. In the second block, perceived stress factors were entered into the model. Third, after controlling for sociodemographic variables and perceived stress factors, perceived social support was entered into the model. Finally, after controlling for sociodemographic variables, perceived stress factors, and perceived social support, coping style was entered into the model.

Results

Comparison of the levels of self-concept between HIV-infected adolescents and control adolescents

The self-concept levels of HIV-infected adolescents were significantly lower than healthy adolescents ($p < 0.05$; Table 1).

Table 1. Comparison of the levels of self-concept between HIV-infected and control adolescents

	HIV-infected adolescents (N = 139)	Healthy adolescents (N = 144)	t	p
Self-concept score	51.55	60.22	-9.37	0.00**

Sociodemographic data and self-concept total scores by different sociodemographic variables

Of the 139 participants, 88 were males and 51 were females. The number of participants in each age group was as follows: 8–13 years, 28; 13–16 years, 80; and 16–18 years, 31. The family economic status was as follows: good, 48; moderate, 79; and poor, 12. Fifty-seven and eighty-two adolescents with AIDS did and did not have an intact family structure, respectively. No significant differences in self-concept total scores existed between gender, age, family economic status, or family structure (Table 2).

Table 2. Participants' socio-demographic data and self-concept total scores by socio-demographic variables

	Group	N (%)	Self-concept score	F/t	p
Gender				0.08	0.78
	Male	88 (63.3)	52.08 ± 10.71		
	Female	51 (36.7)	50.65 ± 11.27		
Age				1.44	0.24
	8-13	28 (20.1)	53.43 ± 11.86		

	13-16	80 (57.6)	50.21 ± 10.67		
	16-18	31 (22.3)	53.32 ± 10.44		
Family economic status				2.74	0.07
	Good	48 (34.5)	50.46 ± 10.03		
	Moderate	79 (56.8)	51.18 ± 11.38		
	Poor	12 (8.6)	58.42 ± 10.90		
Family structure				0.18	0.67
	Intact	82 (59.0)	52.63 ± 10.46		
	Non-intact	57 (41.0)	50.00 ± 11.42		

Relationship between perceived stress, perceived social support, coping style factors, and self-concept total scores

We collected self-concept total scores for perceived stress, perceived social support, and coping style factors in adolescents with AIDS (Table 3). Statistically significant linear relationships existed among perceived stress, perceived social support, coping style factors, and the self-concept total scores of adolescents with AIDS ($p < 0.05$). Among these variables, perceived stress ($r = -0.23$, $p < 0.05$) and negative coping ($r = -0.26$, $p < 0.05$) were negatively related to the self-concept total scores. Conversely, perceived social support ($r = 0.28$, $p < 0.05$) and positive coping ($r = 0.25$, $p < 0.05$) were positively associated with self-concept total scores.

Table 3. Correlations among perceived stress, perceived social support, coping style factors, and self-concept total scores

	Perceived stress	Perceived	Positive coping	Negative
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	social support		coping	
Self-concept	-0.23**	0.28**	0.25**	-0.26**

Hierarchical linear regression analysis of the relationship among perceived stress, perceived social support, coping style factors, and self-concept total scores

Eight variables accounted for 37.0% of the total variance of the self-concept total scores (Table 4). The control variables accounted for 7% of the variance in the self-concept total scores (F change = 2.46), and among the control variables, age ($\beta = -0.19$, $t = -2.16$, $p = 0.03$) was significantly associated with the self-concept total scores. With inclusion of the perceived stress variable, the variance which could be explained increased to 10%. The variance in self-concept total scores (F change = 4.91) and perceived stress ($\beta = -0.19$, $t = -2.22$, $p = 0.03$) was significantly associated with the self-concept total scores. Adding the perceived social support factor contributed to an additional 7% of the variance in the self-concept total scores (F change = 10.55), and perceived social support ($\beta = 0.26$, $t = 3.25$, $p = 0.00$) was significantly associated with the self-concept total scores. Finally, adding the positive and negative coping factors contributed to an additional 20% of the variance in the self-concept total scores (F change = 21.00). Positive ($\beta = 0.50$, $t = 5.75$, $p = 0.00$) and negative coping ($\beta = -0.45$, $t = -5.33$, $p = 0.00$) were significantly associated with the self-concept total scores.

Table 4. Hierarchical linear regression analysis of the relationships among perceived stress,

perceived social support, coping style factors, and self-concept total scores

		β	t	p	F change	R ²	R ² change
Step 1					2.46	0.07	0.07
	Gender	-0.08	-0.98	0.33			
	Age	-0.19	-2.16	0.03			
	Family economic status	0.10	1.10	0.27			
	Family structure	0.11	1.31	0.19			
Step 2					4.91	0.10	0.03
	Gender	-0.10	-1.17	0.24			
	Age	-0.12	-1.37	0.17			
	Family economic status	0.10	1.19	0.24			
	Family structure	0.10	1.14	0.26			
	Perceived stress	-0.19	-2.22	0.03			
Step 3					10.55	0.17	0.07
	Gender	-0.11	-1.36	0.18			
	Age	0.13	-1.55	0.12			
	Family economic status	0.06	0.73	0.47			
	Family structure	0.09	1.16	0.25			
	Perceived stress	-0.18	-2.12	0.04			
	Perceived social support	0.26	3.25	0.00			
Step 4					21.00	0.37	0.20
	Gender	-0.13	-1.76	0.08			
	Age	-0.15	-1.98	0.05			
	Family economic status	0.05	0.64	0.52			
	Family structure	0.07	0.91	0.36			
	Perceived stress	-0.17	-2.20	0.03			
	Perceived social support	0.15	2.06	0.04			
	Positive coping	0.50	5.75	0.00			
	Negative coping	-0.45	-5.33	0.00			

Discussion

This study is the first to explore the factors which influence self-concept among adolescents in China infected with HIV. We selected a group of adolescents with AIDS, and analyzed the risk and protective factors. The purpose of this study was to determine whether perceived stress, perceived social support, and coping style are related to the self-concept of adolescents with HIV. The overall results confirmed that age, perceived stress, perceived social support, and coping style factors are associated with self-concept in adolescents with HIV. Specifically, younger age, lower perceived stress, and lower levels of negative coping were associated with higher levels of self-concept among adolescents with HIV. Conversely, higher perceived social support and more positive coping were positively correlated with the self-concept of adolescents with HIV. These findings highlight the significance of these factors on the self-concept of adolescents with HIV.

Our results showed that age significantly influenced the self-concept of adolescents with HIV. Developmental psychology research has shown that the older the age, the higher the self-concept of adolescents. Our findings showed that the older the adolescents with HIV, the lower the level of self-concept. We conclude that for this group of adolescents, with age, some drop out of school due to illness, face the change in the behavior of their parents, and even death. Adolescents lose confidence as part of their experience of disease along with increased social stress, thus older adolescents

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with HIV have lower self-concept levels.

Our findings showed that perceived stress is negatively related to self-concept in adolescents with HIV. This finding was similar to previous studies. At present, there is no research on the relationship between self-concept and perceived stress of adolescents with HIV. Cohen et al. [32] and Hoffman et al. [33] report high negative correlations between self-concept and perceived stress in adolescents. A study in China also showed that the intensity of perceived stress was significantly correlated with the level of self-concept, which was consistent with the results of our study conducted in adolescents with HIV [34]. Because of the lethality of AIDS and disease-related social discrimination, HIV infections are often subject to great psychological stress [35 36]. Adolescents with HIV not only face the long-term psychological pain of losing parents, but also continue to face a variety of external stressors. These causes can lead to higher perceived stress of adolescents with HIV than experienced by healthy adolescents, thus their self-concept tends to be low. Therefore, in the education of families and schools with HIV-infected adolescents, we should teach them how to best manage and deal with stress, and how to increase their level of self-concept.

We found that perceived social support was positively related to self-concept among adolescents infected with HIV. The existing literature also suggests that adolescents infected with HIV who receive more perceived social support report higher levels of self-concept. A survey involving 21 HIV-positive patients in a southern U.S. city reported that a high level of self-concept largely depends on positive social support

and interactions [37]. In a 5-year follow-up longitudinal study, Haven et al. found that the greater the perceived social support among adolescents infected with HIV, the higher the psychological adaptation and the higher the self-concept. An international study showed that social support from teachers, classmates, and parents increases the self-concept of HIV-infected adolescents. This is consistent with the findings of our study [38]. In some areas, HIV knowledge is not adequate, and HIV-infected adolescents are often subjected to discrimination and indifference from others, resulting in their fear of being rejected. As a result, HIV-infected adolescents lose self-confidence and their sense of self-concept. Support and care from teachers, classmates, and parents play important roles on the sense of self-concept in HIV-infected adolescents. Therefore, we should increase awareness of how to treat and manage AIDS patients. We should encourage HIV-infected adolescents to interact with others, enhance self-confidence, and actively participate in social activities.

Correlation analyses showed that there was a significant positive correlation between self-concept, positive coping style, and problem-solving among HIV-infected adolescents, which was negatively correlated with negative coping style, such as escape, withdrawal, and inferiority. There are many studies that confirm our conclusion. Thoits et al. [39] reported that individuals with active coping strategies acquire a high self-concept, whereas individuals with passive-avoidant coping styles will have low self-esteem. In a northern California adolescent sample, Mantzicopoulos et al. [40] found that high self-concept was correlated with active-positive coping styles. HIV-infected adolescents are a specific group and they

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face many more pressures than healthy adolescents. Such pressures will necessitate facing problems, which may result in a negative coping style, such as escapism. The development of a long-term negative coping style is associated with a variety of psychological problems, which affect ones' own evaluation and understanding. Therefore, the development of positive or negative coping style for self-concept is very important. HIV-infected adolescents should be encouraged to adopt positive and active coping strategies which will improve self-confidence, the ability to face setbacks, and self-concept.

We identified four factors which influence the self-concept of HIV-infected adolescents and discussed two aspects of the risk and protective factors, so that future work can develop a two-way intervention. Our findings suggest that we should provide more social support to adolescents so that they can cope with difficulties in a positive way and reduce their feelings of stress, which may contribute to development of the self-concept.

Study Limitations

Some limitations of this study must be acknowledged. First, the sample size of this study was small. HIV-infected adolescents reside in widely dispersed areas. The survey was conducted in a county of China in Henan province where HIV-infected adolescents are relatively concentrated. Therefore, the findings of the survey can only represent the self-concept of adolescents infected with HIV, but does not represent the entire Henan province or even the entire country. Second, this study was a

cross-sectional survey. After investigating the self-concept of HIV-infected adolescents, we also investigated the perceived stress, social support, and coping styles of adolescents infected with HIV. This study only analyzed the relevance between HIV-infected adolescents and self-concept, and cannot explain the deeper causal relationship among variables; further research and analysis are warranted for validation. Third, the assessment of self-concept was carried out using the scale evaluation method, and for HIV-infected adolescents the differences in individual language and verbal cognitive abilities may interfere with the final findings.

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Contributors

YJY and SYK conceived and designed the study, supervised the analysis, and interpreted the data. XXY and XHQ supervised the analysis, interpreted the data, and

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wrote the preliminary manuscript. ZXQ and LW supervised the data collection by JWZ, WBW, and YWC. SYK performed the test administration, compiled the data, and wrote the preliminary manuscript. All authors contributed to the writing and review of the manuscript and approved the final version. We wish to thank International Science Editing for their help in editing the language of the manuscript.

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Competing interests

The authors declare that there are no competing or potential conflicts of interest. No conflict of interest exists in the submission of the manuscript, and the manuscript was approved by all authors for publication. The work described is original research that has not been published previously, and is not under consideration for publication elsewhere, in whole or in part.

Ethical considerations

The research was conducted in accordance with the ethical guidelines of the Declaration of Helsinki and was approved by the Ethics Committee of Harbin Medical University. All participants provided written informed consent having after being informed of the research purpose, meaning, and content. All the adolescents participated voluntarily.

Data sharing statement

No additional data are available.

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For peer review only

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4-7
Methods			
Study design	4	Present key elements of study design early in the paper	8-9
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	9
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	9
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	9
Bias	9	Describe any efforts to address potential sources of bias	8

Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	10-11
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	12
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	13
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	14
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	15-16
		(b) Report category boundaries when continuous variables were categorized	

		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	19
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	17
Generalisability	21	Discuss the generalisability (external validity) of the study results	18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	21

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Factors influencing self-concept among adolescents infected with HIV: A cross-sectional survey in China

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10 3 Siyuan Ke, M.P.H.^a, Yanjie Yang, M.D.^{a,*}, Xiuxian Yang Ph.D.^a, Xiaohui Qiu Ph.D.^a,
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27 **Abstract**
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31 Objective We found that HIV-infected adolescents are much less self-concept than
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33 11 healthy adolescents. This study aimed to determine the factors influencing
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35 12 self-concept among human immunodeficiency virus (HIV) infected adolescents in
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42 14 Setting: Henan Province, China.
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45 15 A questionnaire was distributed among two groups totaling to 290 adolescents. The
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47 16 Piers-Harris Children's Self-concept Scale, the Perceived Stress Scale, the Perceived
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49 17 Social Support Scale, and the Simplified Coping Style Questionnaire were adapted
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51 18 for a Chinese population. Differences between the groups were tested for significance
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53 19 using the Student's t-test, and ANOVA was used to test continuous variables. The
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55 20 relationship between environmental personality factors and adolescent self-concept
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was examined by Pearson correlation analysis. Hierarchical linear regression analysis was used to model the effects of environmental personality factors on self-concept.

Results

1. The self-concept total score among HIV-infected adolescents was significantly lower than normal adolescents ($p < 0.05$).
2. Hierarchical regression analysis indicated that age ($\beta = -0.19$, $t = -2.16$, $p = 0.03$), perceived stress ($\beta = -0.19$, $t = -2.22$, $p = 0.03$), perceived social support ($\beta = 0.26$, $t = 3.25$, $p = 0.00$), positive coping ($\beta = 0.50$, $t = 5.75$, $p = 0.00$), and negative coping ($\beta = -0.45$, $t = -5.33$, $p = 0.00$) were significantly associated with self-concept total scores.

Conclusions The self-concept of HIV-infected adolescents is related to perceived stress, perceived social support, and coping style. These findings underline the significance of self-concept among adolescents infected with HIV.

Strengths and limitations of this study

1. This is the first study to determine the factors influencing self-concept among HIV-infected adolescents in China.
2. Although HIV-infected adolescents are a special group, the sample size was suitably powered to allow statistical analysis, including hierarchical linear regression.
3. This was a cross-sectional study, and thus causal relationships between the self-concept of HIV-infected adolescents and influencing factors require further

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41 exploration.

42 **Keywords:** adolescence; self-consciousness; AIDS; hierarchical regression analysis

43 **Introduction**

44 Over the years, AIDS has spread throughout the world at an extremely rapid rate. In
45 1985, AIDS began to prevail in a few African countries. By 2005, AIDS had affected
46 nearly all countries and regions worldwide [1]. As a result of AIDS, the mortality rate
47 of the adult population has increased significantly [2]. The inevitable consequence is
48 that a large number of adolescents lose their parents because of AIDS. The typical
49 socioeconomic status of families and individuals in communities with a high
50 incidence of AIDS means that these orphans have a visible vulnerability in terms of
51 physical, psychological, and social adaptation [3]. At present, the number of
52 HIV-infected adolescents in China is large and rapidly increasing. Living conditions,
53 social environment, and mental health difficulties are serious problems that have had
54 an enormous impact on the growth and development of HIV-infected adolescents. The
55 2007 study conducted by Qian and Wang in China reported that prejudice and
56 discrimination have a substantial negative impact on the health of HIV-infected
57 adolescents [4]. The mental health difficulties experienced by AIDS orphans are
58 mainly due to decrease in self-concept and increase in depression [5-7]. All the
59 difficulties described above impact on self-concept among HIV-infected adolescents,
60 and we predict that self-concept in HIV-infected adolescents is lower than in healthy
61 adolescents.

Self-concept is a cognitive assessment of one's own abilities and weaknesses [8] and plays an important role in mental health. Low levels of self-concept are a risk factor of mental health problems. High levels of self-concept are considered to be a protective factor that hinders the development of psychological problems and promotes general health [9-12]. Susan Harter, a Professor of Psychology at DU, proposed a multi-dimensional model of self-concept from the perspective of developmental psychology and believed that adolescence is a critical period for the development of self-concept [13]. An individual's perception of himself/herself changes significantly during adolescence, or even undergoes a dramatic reversal [14]. In the early stages of puberty, adolescents are more likely to compare themselves with others, and to understand the comparisons and judgment of others to themselves. Adolescents also begin to give higher value to these judgments [15]. Social psychology studies have shown that during and after puberty, children become more self-conscious, more receptive, and more concerned about the opinions of others [16 17]. One developmental psychology study has shown that during and after puberty, an adolescent's self-evaluation becomes more comprehensive and changes from that held previously[18]. Previous studies have shown that specific groups of adolescents may be vulnerable to lower levels of self-concept than found in normal groups. For example, studies of adolescents with chronic diseases have shown that their level of self-concept is significantly lower than healthy adolescents. Adolescents with chronic diseases often feel insecure, lonely, isolated, and controlled by changes resulting from chronic disease[19 20]. Therefore, we suggest that chronic diseases such as AIDS,

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84 will have a serious impact on the self-concept of adolescents. To date, no studies have

85 investigated the self-concept of Chinese HIV-infected adolescents. In China,

86 HIV-infected adolescents represent a large but specific group who have experienced

87 multiple losses throughout their lives, thus increasing their risk of psychopathology

88 [21]. Therefore, studying the development of self-concept among HIV-infected

89 adolescents, and identifying methods to help them maintain psychological well-being

90 and healthy growth is of clear importance.

91 The formation and development of self-concept is influenced by many factors. It has

92 been shown that teacher-student relationships, peer relationships, parent-child

93 relationships, parenting patterns, perceived stress, perceived social support, and

94 individual coping styles, are all likely to have an impact on self-concept among

95 adolescents [22]. The current study explored the factors which influence the

96 self-concept of HIV-infected adolescents, focusing on both risk and protective factors,

97 and external environment-individual internal characteristics.

98 A large amount of research data suggest that factors such as perceived stress and

99 perceived social support in the external environment have a significant impact on the

100 formation and development of self-concept. Perceived stress is the result of the

101 perceptual assessment of an individual's own experience of stress resulting from

102 specific situations or events[23]. People have different perceptions about events that

103 occur, and their psychological response differs. Differences in psychological response

104 will have different effects on mental health. In Africa, the incidence of AIDS is

105 extremely high and adolescents are often in a high-crime and precarious environment

[24]. Such an environment may aggravate their sense of pressure, and thus affect their self-concept.

Social support is considered to be an important factor affecting psychological stress and physical health. From a psychological perspective, Cobb suggests that social support includes the following: emotional support; respect and support; and member attribution[25]. Social support can significantly predict the emotional behavior of adolescents, and higher social support has a protective effect on adolescent mental health [26]. Researchers have shown that the relationship between social support and self-concept is stable and positively correlated. There is a difference between social support factors and the correlation between the fractal dimensions of self-concept. Social support for adolescents is primarily derived from parents, teachers, classmates, and friends. Michelle et al. [27] report that the relationship between the frequency of social support and self-concept is significant. Rubin et al. [28] have shown that social support may prevent teenagers with LD (learning disabilities) from mood disorders. LD adolescents who receive more social support from their parents, teachers, and peers, have higher levels of self-concept than adolescents who receive less social support[29]. Barroso [30] concluded that social support is an important factor for adults who are long-term survivors of AIDS. Lack of social support may also cause HIV-infected adolescents to have lower levels of self-concept. Cluver et al. [31] report that orphans in particular may have a lack of social support due to illness or death of family members, thereby distorting their cognitions about themselves and others.

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128 An adolescent’s self-concept is not only affected by external environmental factors,
129 but their own internal factors. Individual coping styles and other factors have a
130 significant impact on the emergence and development of self-concept. Coping style
131 refers to the change in cognition and/or or behavior utilized by an individual in a
132 particular stressful situation, with the aim of managing emotions and improving the
133 problem [32]. Individuals adopt specific coping styles and measures according to their
134 own experiences after cognitive assessment of the response process. Coping style has
135 an important impact on the status of an individual's environmental adaptation and
136 mental health [33]. At present, an important research aspect in clinical psychology is
137 the study of the relationship between an individual’s coping style, and physical and
138 mental health. Xinyi HU et al. [34] have shown that the clarity of self-awareness or
139 self-concept is related to more active coping behavior. Studies of HIV-infected
140 individuals and their coping styles suggest that a high level of active coping is
141 positively related to immunization measures, and may indirectly affect the
142 self-concept of the AIDS patient [35].

143 This study was designed to explore the factors which influence the self-concept of
144 HIV-infected adolescents. We investigated the self-concept of HIV-infected
145 adolescents, considered the environmental and individual levels, and analyzed the
146 relationship between perceived stress, perceived social support, and coping style, and
147 self-concept, in order to better understand the role of self-concept among
148 HIV-infected adolescents. We believe this is the first study of this kind.

149 **Methods**

Sample size and sampling technique

The current study was conducted in a rural county in Henan province, China, where many residents were infected with HIV through blood collection using inadequate hygiene techniques. This rural county has the highest prevalence of HIV infection in the area. We obtained village-level HIV surveillance data from the anti-epidemic station in each of the counties to identify the villages with the highest number of AIDS-related deaths and confirmed HIV infections.

A questionnaire was distributed among two groups of adolescents; 140 questionnaires were distributed in the case group (HIV-infected adolescents) and 139 valid questionnaires were returned (response rate of 99.3%). Among the adolescents in the case group, there were 88 boys (63.3%) and 51 girls (36.7%), and the average age was 15.89 ± 2.8 years. The control group (healthy adolescents) was issued 150 questionnaires, and 144 valid questionnaires were returned (response rate of 96.0%). Among the adolescents in the control group, there were 91 boys (63.2%) and 53 girls (36.8%), and the average age was 13.85 ± 1.2 years. The total number of participants in this study was therefore 283 adolescents aged 10–20 years and of Han ethnicity. Participation of the adolescents was voluntary, and all provided informed consent.

Procedure

To recruit HIV-infected adolescents, we worked with the town leaders to generate lists of adolescents with confirmed diagnoses of HIV/AIDS. We approached the adolescents on the lists and invited them to participate in the study. After the

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eligibility of an adolescent was confirmed, the interviewer(s) provided him/her with a detailed description of the study design, potential benefits and risks, confidentiality issues and invited him/her to participate. When an adolescent agreed to be included in the study, the parents of the person were invited to participate by means of letters.

HIV-infected adolescents 10–20 years of age (inclusive) comprised the case group. The healthy children in Shangcai County who were not infected with HIV were compared as the control group. The parents are healthy and the family is complete. The inclusion criteria were as follows: 10-20 years of age; the definition of children with HIV infection was not met in this study; and in the first half of the investigation, the children resided in Shangcai County. The exclusion criteria were as follows:: unconfirmed HIV infection status; and unable to participate due to severe disease and central nervous system problems (such as encephalopathy or epilepsy).

The research met ethical guidelines according the to the Declaration of Helsinki, and approval was granted by the Ethics Committee of Harbin Medical University. All participants signed informed consent forms after receiving explanations of the research purpose, meaning, and content. All of the adolescents participated voluntarily.

Patient and Public Involvement

Self-concept is a cognitive assessment of one’s own abilities and weaknesses. Self-concept itself is the subjective and internal evaluation of one's self. Therefore, we selected the Piers-Harris Children's Self-concept Scale to measure self-concept, which

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4 192 did not influence subjective preference on the results. We will forward the results to
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6 193 the local CDC via email. The CDC informs participants by telephone.
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16 196 The Piers-Harris Children's Self-concept Scale is a paper-and-pencil test consisting of
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18 197 80 items which are scored as true or false. The items are self-descriptive declarative
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20 198 statements. The scores range from 1–80; higher scores indicate higher levels
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22 199 self-concept. The statements are worded in both positive and negative language to
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24 200 control for social desirability responding. The scale has good reliability and validity
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26 201 and the Cronbach's alpha of the scale was 0.858 in the current study.
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33 202 Stress related to interpersonal stressors was assessed by the Perceived Stress Scale.
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35 203 The scale consists of ten items. Each item has a score range of 0–4, with a possible
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37 204 total score of 40 overall. Higher scores indicate higher levels of stress. The internal
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39 205 consistency measured by Cronbach's alpha in this study was 0.847.
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44 206 The Perceived Social Support Scale (PSSS), developed by Zimet et al. consists of 12
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46 207 items that were revised from three subscales (family, friend, and other support).
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49 208 Participants responded to the items on a 7-point Likert-type scale indicating
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51 209 disagreement/agreement. Each item was divided into a total score for social support.
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54 210 Items were adjusted to be more appropriate for HIV-infected children in the current
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56 211 study. The items "leaders, relatives and colleagues" were changed to "teachers,
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59 212 relatives and students. Cronbach's alpha was 0.887 in this study. We used the
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213 Simplified Coping Style Questionnaire (SCSQ) to measure coping style. The SCSQ
214 includes 20 items that contain two dimensions of coping (positive and negative). Each
215 dimension consists of 10 items, and each item is scored on a 5-point scale, where 1
216 indicates ‘certainly not’ and 5 indicates ‘certainly.’ A higher score on one dimension
217 indicates that the individual is more likely to utilize this type of coping style. The
218 questionnaire is highly reliable and suitable for a Chinese population. The Cronbach’s
219 alpha for the two independent dimensions of coping were 0.70 and 0.69.

220 **Data analysis**

221 The Statistical Package for Social Sciences 19.0 (SPSS 19.0) program (IBM, Armonk,
222 NY, USA) was used for statistical analysis. All tests were two-tailed and the
223 significance level was set at a $p < 0.05$. Differences between the groups were tested
224 using the Student’s t-test and ANOVA was used to test continuous variables. The
225 relationship between environmental personality factors and adolescent self-concept
226 was examined with Pearson correlation analyses. Hierarchical linear regression
227 analysis was used to model the effects of environmental personality factors on
228 self-concept in adolescents. In the regression model, gender, age, family economic
229 status, and family structure were entered in the first block to control for potential
230 confounding variables. In the second block, perceived stress factors were entered into
231 the model. Third, after controlling for sociodemographic variables and perceived
232 stress factors, perceived social support was entered into the model. Finally, after
233 controlling for sociodemographic variables, perceived stress factors, and perceived
234 social support, coping style was entered into the model.

Results

Study population

Adolescents were asked to report on individual and family characteristics including age, gender, family economic status (i.e., good, moderate, and poor), and family structure (intact/non-intact).

Comparison of self-concept between the case and control groups

The self-concept levels of HIV-infected adolescents were significantly lower than healthy adolescents ($p < 0.05$; Table 1).

Table 1. Comparison of the levels of self-concept between HIV-infected and control adolescents

	HIV-infected adolescents (N = 139)	Healthy adolescents (N = 144)	t	p
Self-concept score	51.55	60.22	-9.37	0.00**

Sociodemographic data and self-concept total scores by different sociodemographic variables

Of the 139 participants, 88 were males and 51 were females. The number of participants in each age group was as follows: 8–13 years, 28; 13–16 years, 80; and 16–18 years, 31. The family economic status was as follows: good, 48; moderate, 79; and poor, 12. Fifty-seven and eighty-two HIV-infected adolescents did and did not have an intact family structure, respectively. No significant differences in self-concept

total scores existed between gender, age, family economic status, or family structure					
(Table 2).					
Table 2. Participants’ socio-demographic data and self-concept total scores by socio-demographic variables					
	Group	N (%)	Self-concept score	F/t	p
Gender				0.08	0.78
	Male	88 (63.3)	52.08 ± 10.71		
	Female	51 (36.7)	50.65 ± 11.27		
Age				1.44	0.24
	8-13	28 (20.1)	53.43 ± 11.86		
	13-16	80 (57.6)	50.21 ± 10.67		
	16-18	31 (22.3)	53.32 ± 10.44		
Family economic status				2.74	0.07
	Good	48 (34.5)	50.46 ± 10.03		
	Moderate	79 (56.8)	51.18 ± 11.38		
	Poor	12 (8.6)	58.42 ± 10.90		
Family structure				0.18	0.67
	Intact	82 (59.0)	52.63 ± 10.46		
	Non-intact	57 (41.0)	50.00 ± 11.42		

Relationship between perceived stress, perceived social support, coping style factors, and self-concept total scores

We collected self-concept total scores for perceived stress, perceived social support,

and coping style factors in HIV-infected adolescents (Table 3). Statistically significant linear relationships existed among perceived stress, perceived social support, coping style factors, and the self-concept total scores of HIV-infected adolescents ($p < 0.05$). Among these variables, perceived stress ($r = -0.23$, $p < 0.05$) and negative coping ($r = -0.26$, $p < 0.05$) were negatively related to the self-concept total scores. Conversely, perceived social support ($r = 0.28$, $p < 0.05$) and positive coping ($r = 0.25$, $p < 0.05$) were positively associated with self-concept total scores.

Table 3. Correlations among perceived stress, perceived social support, coping style factors, and self-concept total scores

	Perceived stress	Perceived social support	Positive coping	Negative coping
Self-concept	-0.23**	0.28**	0.25**	-0.26**

Hierarchical linear regression analysis of the relationship among perceived stress, perceived social support, coping style factors, and self-concept total scores

Eight variables accounted for 37.0% of the total variance of the self-concept total scores (Table 4). The control variables accounted for 7% of the variance in the self-concept total scores (F change = 2.46), and among the control variables, age ($\beta = -0.19$, $t = -2.16$, $p = 0.03$) was significantly associated with the self-concept total scores. With inclusion of the perceived stress variable, the variance which could be explained increased to 10%. The variance in self-concept total scores (F change = 4.91) and perceived stress ($\beta = -0.19$, $t = -2.22$, $p = 0.03$) was significantly associated

with the self-concept total scores. Adding the perceived social support factor contributed to an additional 7% of the variance in the self-concept total scores (F change = 10.55), and perceived social support ($\beta = 0.26$, $t = 3.25$, $p = 0.00$) was significantly associated with the self-concept total scores. Finally, adding the positive and negative coping factors contributed to an additional 20% of the variance in the self-concept total scores (F change = 21.00). Positive ($\beta = 0.50$, $t = 5.75$, $p = 0.00$) and negative coping ($\beta = -0.45$, $t = -5.33$, $p = 0.00$) were significantly associated with the self-concept total scores.

Table 4. Hierarchical linear regression analysis of the relationships among perceived stress, perceived social support, coping style factors, and self-concept total scores

		β	t	p	F change	R ²	R ² change
Step 1					2.46	0.07	0.07
	Gender	-0.08	-0.98	0.33			
	Age	-0.19	-2.16	0.03			
	Family economic status	0.10	1.10	0.27			
	Family structure	0.11	1.31	0.19			
Step 2					4.91	0.10	0.03
	Gender	-0.10	-1.17	0.24			
	Age	-0.12	-1.37	0.17			
	Family economic status	0.10	1.19	0.24			
	Family structure	0.10	1.14	0.26			
	Perceived stress	-0.19	-2.22	0.03			
Step 3					10.55	0.17	0.07
	Gender	-0.11	-1.36	0.18			
	Age	0.13	-1.55	0.12			

		Family economic status	0.06	0.73	0.47		
		Family structure	0.09	1.16	0.25		
		Perceived stress	-0.18	-2.12	0.04		
		Perceived social support	0.26	3.25	0.00		
	Step 4					21.00	0.37 0.20
		Gender	-0.13	-1.76	0.08		
		Age	-0.15	-1.98	0.05		
		Family economic status	0.05	0.64	0.52		
		Family structure	0.07	0.91	0.36		
		Perceived stress	-0.17	-2.20	0.03		
		Perceived social support	0.15	2.06	0.04		
		Positive coping	0.50	5.75	0.00		
		Negative coping	-0.45	-5.33	0.00		

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294 Discussion

295 This study was the first to explore the factors which influence self-concept among
 296 adolescents in China infected with HIV. We selected a group of HIV-infected
 297 adolescents, and analyzed the risk and protective factors. The purpose of this study
 298 was to determine whether perceived stress, perceived social support, and coping style
 299 are related to the self-concept of adolescents with HIV. The overall results confirmed
 300 that age, perceived stress, perceived social support, and coping style factors were
 301 associated with self-concept in adolescents with HIV. Specifically, younger age,
 302 lower perceived stress, and lower levels of negative coping were associated with
 303 higher levels of self-concept among adolescents with HIV. Conversely, higher
 304 perceived social support and more positive coping were positively correlated with the

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305 self-concept of adolescents with HIV. These findings highlight the significance of

306 these factors on the self-concept of adolescents with HIV.

307 Our results showed that age significantly influenced the self-concept of adolescents

308 with HIV. Developmental psychology has shown that the children's self-concept

309 changes dramatically during adolescence and increases significantly with age [36].

310 Our findings showed that the older the adolescents with HIV, the lower the level of

311 self-concept. We concluded that for this group of adolescents, with age, some drop

312 out of school due to illness, face the change in the behavior of their parents, and even

313 death. Adolescents lose confidence as part of their experience of disease along with

314 increased social stress, thus older adolescents with HIV have lower self-concept

315 levels.

316 Our findings showed that perceived stress is negatively related to self-concept in

317 adolescents with HIV. This finding was similar to previous studies. At present, there

318 was no research on the relationship between self-concept and perceived stress of

319 adolescents with HIV. Civitci et al.[37] and Hoffman et al. [38] report high negative

320 correlations between self-concept and perceived stress in adolescents. A study in

321 China also showed that the intensity of perceived stress was significantly correlated

322 with the level of self-concept, which was consistent with the results of our study

323 conducted in adolescents with HIV [39]. Because of the lethality of AIDS and

324 disease-related social discrimination, HIV infections are often subject to great

325 psychological stress [40 41]. Adolescents with HIV not only face the long-term

326 psychological pain of losing parents, but also continue to face a variety of external

stressors. These causes can lead to higher perceived stress of adolescents with HIV than experienced by healthy adolescents, thus their self-concept tends to be low. Therefore, in the education of families and schools with HIV-infected adolescents, we should teach them how to best manage and deal with stress, and how to increase their level of self-concept. We should mainly encourage them to develop their ability to resist pressure and self-regulation. Society should provide HIV-infected adolescents with social support from a professional psychological perspective.

We found that perceived social support was positively related to self-concept among adolescents infected with HIV. The existing literature also suggests that adolescents infected with HIV who receive more perceived social support report higher levels of self-concept. A survey involving 21 HIV-positive patients in a southern U.S. city reported that a high level of self-concept largely depends on positive social support and interactions [42]. In a 5-year follow-up longitudinal study, Haven et al. found that the greater the perceived social support among adolescents infected with HIV, the higher the psychological adaptation and the higher the self-concept. An international study showed that social support from teachers, classmates, and parents increases the self-concept of HIV-infected adolescents [43]. This was consistent with the findings of our study. In some areas, HIV knowledge is not adequate, and HIV-infected adolescents are often subjected to discrimination and indifference from others, resulting in their fear of being rejected. As a result, HIV-infected adolescents lose self-confidence and their sense of self-concept. Support and care from teachers, classmates, and parents play important roles on the sense of self-concept in

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349 HIV-infected adolescents. Therefore, we should increase awareness of how to treat
350 and manage AIDS patients. We should encourage HIV-infected adolescents to
351 interact with others, enhance self-confidence, and actively participate in social
352 activities.

353 Correlation analyses showed that there was a significant positive correlation between
354 self-concept, positive coping style, and problem-solving among HIV-infected
355 adolescents, which was negatively correlated with negative coping style, such as
356 escape, withdrawal, and inferiority. There are many studies that confirm our
357 conclusion. Pala et al. [44] reported that individuals with active coping strategies
358 acquire a high self-concept, whereas individuals with passive-avoidant coping styles
359 will have low self-esteem. In a northern California adolescent sample,
360 Mantzicopoulos et al. [45] found that high self-concept was correlated with
361 active-positive coping styles. HIV-infected adolescents are a specific group and they
362 face many more pressures than healthy adolescents. Such pressures will necessitate
363 facing problems, which may result in a negative coping style, such as escapism. The
364 development of a long-term negative coping style is associated with a variety of
365 psychological problems, which affect ones' own evaluation and understanding.
366 Therefore, the development of positive or negative coping style for self-concept is
367 very important. HIV-infected adolescents should be encouraged to adopt positive and
368 active coping strategies which will improve self-confidence, the ability to face
369 setbacks, and self-concept.

370 We identified four factors which influence the self-concept of HIV-infected

adolescents and discussed two aspects of the risk and protective factors, so that future work can develop a two-way intervention. Our findings suggest that we should provide more social support to adolescents so that they can cope with difficulties in a positive way and reduce their feelings of stress, which may contribute to development of the self-concept.

Study Limitations

Some limitations of this study must be acknowledged. First, the sample size of this study was small. HIV-infected adolescents reside in widely dispersed areas. The survey was conducted in a county of China in Henan province where HIV-infected adolescents are relatively concentrated. Therefore, the findings of the survey can only represent the self-concept of adolescents infected with HIV, but does not represent the entire Henan province or even the entire country. Second, this study was a cross-sectional survey. After investigating the self-concept of HIV-infected adolescents, we also investigated the perceived stress, social support, and coping styles of adolescents infected with HIV. This study only analyzed the relevance between HIV-infected adolescents and self-concept, and cannot explain the deeper causal relationship among variables; further research and analysis are warranted for validation. Third, the assessment of self-concept was carried out using the scale evaluation method, and for HIV-infected adolescents the differences in individual language and verbal cognitive abilities may interfere with the final findings.

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Contributors

YJY and SYK conceived and designed the study, supervised the analysis, and interpreted the data. XXY and XHQ supervised the analysis, interpreted the data, and wrote the preliminary manuscript. ZXQ and LW supervised the data collection by JWZ, WBW, and YWC. SYK performed the test administration, compiled the data, and wrote the preliminary manuscript. All authors contributed to the writing and review of the manuscript and approved the final version. We wish to thank International Science Editing for their help in editing the language of the manuscript. At the same time, we would like to thank the patient advisers for their cooperation and support in this study.

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Competing interests

The authors declare that there are no competing or potential conflicts of interest. No conflict of interest exists in the submission of the manuscript, and the manuscript was approved by all authors for publication. The work described is original research that has not been published previously, and is not under consideration for publication elsewhere, in whole or in part.

Ethical considerations

The research was conducted in accordance with the ethical guidelines of the Declaration of Helsinki and was approved by the Ethics Committee of Harbin Medical University. All participants provided written informed consent having after being informed of the research purpose, meaning, and content. All the adolescents participated voluntarily.

Data sharing statement

No additional data are available.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4-7
Methods			
Study design	4	Present key elements of study design early in the paper	8-9
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	9
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	9
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	9
Bias	9	Describe any efforts to address potential sources of bias	8

Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	10-11
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	12
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	13
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	14
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	15-16
		(b) Report category boundaries when continuous variables were categorized	

		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	19
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	17
Generalisability	21	Discuss the generalisability (external validity) of the study results	18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	21

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Factors influencing self-concept among adolescents infected with HIV: A cross-sectional survey in China

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1 Factors influencing self-concept among adolescents infected with HIV: A
2 cross-sectional survey in China

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9 **Abstract**

10 Overview The mental health problems of HIV-infected adolescents are crucial. It is of
11 great significance to explore which factors can affect the self-evaluation and
12 understanding of HIV-infected adolescents.

13 Objective We found that HIV-infected adolescents have much less self-concept than
14 healthy adolescents. This study aimed to determine the factors influencing
15 self-concept among human immunodeficiency virus (HIV) infected adolescents in
16 China.

17 Setting A questionnaire was distributed among two groups totaling to 290 adolescents
18 in Henan Province, China. 140 questionnaires were distributed in the case group
19 (HIV-infected adolescents) and the control group (healthy adolescents) was issued
20 150 questionnaires.

The Piers-Harris Children's Self-concept Scale, the Perceived Stress Scale, the Perceived Social Support Scale, and the Simplified Coping Style Questionnaire were adapted for a Chinese population. Differences between the groups were tested for significance using the Student's t-test, and ANOVA was used to test continuous variables. The relationship between environmental personality factors and adolescent self-concept was examined by Pearson correlation analysis. Hierarchical linear regression analysis was used to model the effects of environmental personality factors on self-concept.

Results The self-concept total score among HIV-infected adolescents was significantly lower than normal adolescents ($p < 0.05$). Hierarchical regression analysis indicated that age ($\beta = -0.19$, $t = -2.16$, $p = 0.03$), perceived stress ($\beta = -0.19$, $t = -2.22$, $p = 0.03$), perceived social support ($\beta = 0.26$, $t = 3.25$, $p = 0.00$), positive coping ($\beta = 0.50$, $t = 5.75$, $p = 0.00$), and negative coping ($\beta = -0.45$, $t = -5.33$, $p = 0.00$) were significantly associated with self-concept total scores.

Conclusions The self-concept of HIV-infected adolescents is related to perceived stress, perceived social support, and coping style. These findings underline the significance of self-concept among adolescents infected with HIV.

Strengths and limitations of this study

1. This is the first study to determine the factors influencing self-concept among HIV-infected adolescents in China.

2. Although HIV-infected adolescents are a special group, the sample size was

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42 suitably powered to allow statistical analysis including hierarchical linear regression.

43 3. This was a cross-sectional study and thus causal relationships between the
44 self-concept of HIV-infected adolescents and influencing factors require further
45 exploration.

46 **Keywords:** adolescence; self consciousness; AIDS; Hierarchical regression analysis

47 **Introduction**

48 Over the years, AIDS has spread throughout the world at an extremely rapid rate. In
49 1985, AIDS began to prevail in a few African countries. By 2005, AIDS had affected
50 nearly all countries and regions worldwide [1]. As a result of AIDS, the mortality rate
51 of the adult population has increased significantly [2]. HIV is spread through
52 exposure to HIV-infected blood or other body fluids. The primary transmission modes
53 are contact with an infected person’s body fluids during unprotected sex,
54 blood-to-blood exposure (either by direct contact or through needle sharing among
55 injection drug users), and perinatal transmission from infected mother to child. The
56 main target of mother-to-child transmission of AIDS is children and adolescents and
57 the inevitable consequence is that a large number of adolescents lose their parents
58 because of AIDS. The typical socioeconomic status of families and individuals in
59 communities with a high incidence of AIDS means that those adolescents who have
60 acquired AIDS through mother-to-child transmission have a visible vulnerability in
61 terms of physical, psychological, and social adaptation [3]. At present, the number of
62 HIV-infected adolescents in China is large and rapidly increasing. Living conditions,

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4 63 social environment, and mental health difficulties are serious problems that have had
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6 64 an enormous impact on the growth and development of HIV-infected adolescents. The
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9 65 study of Qian and Wang in China in 2007 reported that prejudice and discrimination
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12 66 have a substantial negative impact on the health of HIV-infected adolescents [4]. The
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14 67 mental health difficulties experienced by the children who lost their parents to
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17 68 HIV/AIDS are mainly due to decrease in self-concept and increase in depression
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20 69 [5-7]. All the difficulties described above impact on self-concept among HIV-infected
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22 70 adolescents, and we predict that self-concept in HIV-infected adolescents is lower
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25 71 than in healthy adolescents.

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28 72 Self-concept is a cognitive assessment of one's own abilities and weaknesses [8] and
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31 73 plays an important role in mental health. Low levels of self-concept are a risk factor
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33 74 of mental health problems. High levels of self-concept are considered to be a
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36 75 protective factor that hinders the development of psychological problems and
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39 76 promotes general health [9-12]. Susan Harter proposed a multi-dimensional model of
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42 77 self-concept from the perspective of developmental psychology and believed that
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44 78 adolescence was a critical period for the development of self-concept [13]. An
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47 79 individual's perception of himself/herself changes significantly during adolescence, or
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50 80 even undergoes a dramatic reversal [14]. In the early stages of puberty, adolescents
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53 81 are more likely to compare themselves with others, and to understand the comparisons
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56 82 and judgment of others to themselves. Adolescents also begin to give higher value to
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59 83 these judgments [15]. Social psychology studies have shown that during and after
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84 84 puberty, children become more self-conscious, more receptive, and more concerned

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85 about the opinions of others [16 17]. One developmental psychology study has shown
86 that during and after puberty, an adolescent’s self-evaluation becomes more
87 comprehensive and changes from that held previously[18]. Previous studies have
88 shown that specific groups of adolescents may be vulnerable to lower levels of
89 self-concept than found in normal groups. For example, studies of adolescents with
90 chronic diseases have shown that their level of self-concept is significantly lower than
91 healthy adolescents. Adolescents with chronic diseases often feel insecure, lonely,
92 isolated, and controlled by changes resulting from chronic disease[19 20]. Therefore,
93 we suggest that chronic diseases such as AIDS, will have a serious impact on the
94 self-concept of adolescents. To date, no studies have investigated the self-concept of
95 Chinese HIV-infected adolescents. In China, HIV-infected adolescents represent a
96 large but specific group who have experienced multiple losses throughout their lives,
97 thus increasing their risk of psychopathology [21]. Therefore, studying the
98 development of self-concept among HIV-infected adolescents, and identifying
99 methods to help them maintain psychological well-being and healthy growth is of
100 clear importance.

101 The formation and development of self-concept is influenced by many factors. It has
102 been shown that teacher-student relationships, peer relationships, parent-child
103 relationships, parenting patterns, perceived stress, perceived social support, and
104 individual coping styles, are all likely to have an impact on self-concept among
105 adolescents [22]. The current study explored the factors which influence the
106 self-concept of HIV-infected adolescents, focusing on both risk and protective factors,

107 and external environment-individual internal characteristics.

108 A large amount of research data suggest that factors such as perceived stress and
109 perceived social support in the external environment have a significant impact on the
110 formation and development of self-concept. Perceived stress is the result of the
111 perceptual assessment of an individual's own experience of stress resulting from
112 specific situations or events[23]. People have different perceptions about events that
113 occur, and their psychological response differs. Differences in psychological response
114 will have different effects on mental health. In Africa, the incidence of AIDS is
115 extremely high and adolescents are often in a high-crime and precarious environment
116 [24]. Such an environment may aggravate their sense of pressure, and thus affect their
117 self-concept.

118 Social support is considered to be an important factor affecting psychological stress
119 and physical health. From a psychological perspective, Cobb suggests that social
120 support includes the following: emotional support; respect and support; and member
121 attribution[25]. Social support can significantly predict the emotional behavior of
122 adolescents, and higher social support has a protective effect on adolescent mental
123 health [26]. Researchers have shown that the relationship between social support and
124 self-concept is stable and positively correlated. There is a difference between social
125 support factors and the correlation between the fractal dimensions of self-concept.
126 Social support for adolescents is primarily derived from parents, teachers, classmates,
127 and friends. Michelle et al. [27] report that the relationship between the frequency of
128 social support and self-concept is significant. Rubin et al. [28] have shown that social

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support may prevent teenagers with LD (learning disabilities) from mood disorders.

LD adolescents who receive more social support from their parents, teachers, and peers, have higher levels of self-concept than adolescents who receive less social support[29]. Barroso [30] concluded that social support is an important factor for adults who are long-term survivors of AIDS. Lack of social support may also cause HIV-infected adolescents to have lower levels of self-concept. Cluver et al. [31] report that orphans in particular may have a lack of social support due to illness or death of family members, thereby distorting their cognitions about themselves and others.

An adolescent's self-concept is not only affected by external environmental factors, but their own internal factors. Individual coping styles and other factors have a significant impact on the emergence and development of self-concept. Coping style refers to the change in cognition and/or or behavior utilized by an individual in a particular stressful situation, with the aim of managing emotions and improving the problem [32]. Individuals adopt specific coping styles and measures according to their own experiences after cognitive assessment of the response process. Coping style has an important impact on the status of an individual's environmental adaptation and mental health [33]. At present, an important research aspect in clinical psychology is the study of the relationship between an individual's coping style, and physical and mental health. Xinyi HU et al. [34] have shown that the clarity of self-awareness or self-concept is related to more active coping behavior. Studies of HIV-infected individuals and their coping styles suggest that a high level of active coping is

151 positively related to immunization measures, and may indirectly affect the
152 self-concept of the AIDS patient [35].

153 This study was designed to explore the factors which influence the self-concept of
154 HIV-infected adolescents. We investigated the self-concept of HIV-infected
155 adolescents, considered the environmental and individual levels, and analyzed the
156 relationship between perceived stress, perceived social support, and coping style, and
157 self-concept, in order to better understand the role of self-concept among
158 HIV-infected adolescents. We believe this is the first study of this kind in China.

159 **Methods**

160 **Sample size and sampling technique**

161 The current study was conducted in a rural county in Henan province, China, where
162 many residents were infected with HIV through blood collection using inadequate
163 hygiene techniques. This rural county has the highest prevalence of HIV infection in
164 the area. We obtained village-level HIV surveillance data from the anti-epidemic
165 station in each of the counties to identify the villages with the highest number of
166 AIDS-related deaths and confirmed HIV infections. The adolescents we surveyed
167 were all infected by mother-to-child transmission of HIV.

168 A questionnaire was distributed among two groups of adolescents; 140 questionnaires
169 were distributed in the case group (HIV-infected adolescents) and 139 valid
170 questionnaires were returned (response rate of 99.3%). Among the adolescents in the
171 case group, there were 88 boys (63.3%) and 51 girls (36.7%), and the average age was

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15.89 ± 2.8 years. The control group (healthy adolescents) was issued 150 questionnaires, and 144 valid questionnaires were returned (response rate of 96.0%). Among the adolescents in the control group, there were 91 boys (63.2%) and 53 girls (36.8%), and the average age was 13.85 ± 1.2 years. The total number of participants in this study was therefore 283 adolescents aged 10–20 years and of Han ethnicity. Participation of the adolescents was voluntary, and all provided informed consent.

Procedure

To recruit HIV-infected adolescents, we worked with the town leaders to generate lists of adolescents with confirmed diagnoses of HIV/AIDS. We approached the adolescents on the lists and invited them to participate in the study. After the eligibility of an adolescent was confirmed, the interviewer(s) provided him/her with a detailed description of the study design, potential benefits and risks, confidentiality issues and invited him/her to participate. When an adolescent agreed to be included in the study, the parents of the person were invited to participate by means of letters. HIV-infected adolescents 10–20 years of age (inclusive) comprised the case group. The healthy children in shangcai county who were not infected with HIV were compared as the control group. The parents are healthy and the family is complete. Inclusion criteria: age 10-20 years old; It does not meet the definition of children with HIV infection in this study; In the first half of the investigation, the children have been living in shangcai county. The exclusion criteria were: unconfirmed HIV infection status; The body is unable to participate in severe diseases and cannot

193 participate due to central nervous system problems (such as encephalopathy, epilepsy,
194 etc.).

195 The research met ethical guidelines according the to the Declaration of Helsinki, and
196 approval was granted by the Ethics Committee of Harbin Medical University. All
197 participants signed informed consent forms after receiving explanations of the
198 research purpose, meaning, and content. All of the adolescents participated
199 voluntarily.

200 **Patient and Public Involvement**

201 Self-concept is a cognitive assessment of one's own abilities and weaknesses.
202 Self-concept itself is the subjective and internal evaluation of one's self. Therefore, we
203 selected the Piers-Harris Children's Self-concept Scale to measure their self-concept,
204 without the influence of subjective preference on the results. We will send the results
205 to the local CDC in the form of email after we get the results. The CDC informs
206 participants by phone.

207 **Measures**

208 **Outcome measures**

209 The Piers-Harris Children's Self-concept Scale is a paper-and-pencil test consisting of
210 80 items which are scored as true or false. The items are self-descriptive declarative
211 statements. The scores range from 1–80; higher scores indicate higher levels
212 self-concept. The statements are worded in both positive and negative language to
213 control for social desirability responding. The scale has good reliability and validity

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and the Cronbach’s alpha of the scale was 0.858 in the current study.

Stress related to interpersonal stressors was assessed by the Perceived Stress Scale. The scale consists of ten items. Each item has a score range of 0–4, with a possible total score of 40 overall. Higher scores indicate higher levels of stress. The internal consistency measured by Cronbach’s alpha in this study was 0.847.

The Perceived Social Support Scale (PSSS), developed by Zimet et al. consists of 12 items that were revised from three subscales (family, friend, and other support). Participants responded to the items on a 7-point Likert-type scale indicating disagreement/agreement. Each item was divided into a total score for social support. Items were adjusted to be more appropriate for HIV-infected children in the current study. The items "leaders, relatives and colleagues" were changed to "teachers, relatives and students. Cronbach’s alpha was 0.887 in this study. We used the Simplified Coping Style Questionnaire (SCSQ) to measure coping style. The SCSQ includes 20 items that contain two dimensions of coping (positive and negative). Each dimension consists of 10 items, and each item is scored on a 5-point scale, where 1 indicates ‘certainly not’ and 5 indicates ‘certainly.’ A higher score on one dimension indicates that the individual is more likely to utilize this type of coping style. The questionnaire is highly reliable and suitable for a Chinese population. The Cronbach’s alpha for the two independent dimensions of coping were 0.70 and 0.69.

Data analysis

The Statistical Package for Social Sciences 19.0 (SPSS 19.0) program (IBM, Armonk,

NY, USA) was used for statistical analysis. All tests were two-tailed and the significance level was set at a $p < 0.05$. Differences between the groups were tested using the Student's t-test and ANOVA was used to test continuous variables. The relationship between environmental personality factors and adolescent self-concept was examined with Pearson correlation analyses. Hierarchical linear regression analysis was used to model the effects of environmental personality factors on self-concept in adolescents. In the regression model, gender, age, family economic status, and family structure were entered in the first block to control for potential confounding variables. In the second block, perceived stress factors were entered into the model. Third, after controlling for sociodemographic variables and perceived stress factors, perceived social support was entered into the model. Finally, after controlling for sociodemographic variables, perceived stress factors, and perceived social support, coping style was entered into the model.

Results

Study population

Adolescents were asked to report on individual and family characteristics including age, gender, family economic status (i.e., good, moderate, and poor), and family structure (intact/non-intact).

Comparison of self-concept between the Case group and control group

The self-concept levels of HIV-infected adolescents were significantly lower than healthy adolescents ($p < 0.05$; Table 1).

Table 1. Comparison of the levels of self-concept between HIV-infected and control adolescents

	HIV-infected adolescents (N = 139)	Healthy adolescents (N = 144)	t	p
Self-concept score	51.55	60.22	-9.37	0.00**

Sociodemographic data and self-concept total scores by different sociodemographic variables

Of the 139 participants, 88 were males and 51 were females. The number of participants in each age group was as follows: 8–13 years, 28; 13–16 years, 80; and 16–18 years, 31. The family economic status was as follows: good, 48; moderate, 79; and poor, 12. Fifty-seven and eighty-two HIV-infected adolescents did and did not have an intact family structure, respectively. No significant differences in self-concept total scores existed between gender, age, family economic status, or family structure (Table 2).

Table 2. Participants' socio-demographic data and self-concept total scores by socio-demographic variables

Group	N (%)	Self-concept score	F/t	p
Gender			0.08	0.78
Male	88 (63.3)	52.08 ± 10.71		
Female	51 (36.7)	50.65 ± 11.27		

Age				1.44	0.24
	8-13	28 (20.1)	53.43 ± 11.86		
	13-16	80 (57.6)	50.21 ± 10.67		
	16-18	31 (22.3)	53.32 ± 10.44		
Family economic status				2.74	0.07
	Good	48 (34.5)	50.46 ± 10.03		
	Moderate	79 (56.8)	51.18 ± 11.38		
	Poor	12 (8.6)	58.42 ± 10.90		
Family structure				0.18	0.67
	Intact	82 (59.0)	52.63 ± 10.46		
	Non-intact	57 (41.0)	50.00 ± 11.42		

Relationship between perceived stress, perceived social support, coping style factors, and self-concept total scores

We collected self-concept total scores for perceived stress, perceived social support, and coping style factors in HIV-infected adolescents (Table 3). Statistically significant linear relationships existed among perceived stress, perceived social support, coping style factors, and the self-concept total scores of HIV-infected adolescents ($p < 0.05$). Among these variables, perceived stress ($r = -0.23$, $p < 0.05$) and negative coping ($r = -0.26$, $p < 0.05$) were negatively related to the self-concept total scores. Conversely, perceived social support ($r = 0.28$, $p < 0.05$) and positive coping ($r = 0.25$, $p < 0.05$) were positively associated with self-concept total scores.

Table 3. Correlations among perceived stress, perceived social support, coping style factors, and

self-concept total scores				
	Perceived stress	Perceived social support	Positive coping	Negative coping
Self-concept	−0.23**	0.28**	0.25**	−0.26**

Hierarchical linear regression analysis of the relationship among perceived stress, perceived social support, coping style factors, and self-concept total scores

Eight variables accounted for 37.0% of the total variance of the self-concept total scores (Table 4). The control variables accounted for 7% of the variance in the self-concept total scores (F change = 2.46), and among the control variables, age ($\beta = -0.19$, $t = -2.16$, $p = 0.03$) was significantly associated with the self-concept total scores. With inclusion of the perceived stress variable, the variance which could be explained increased to 10%. The variance in self-concept total scores (F change = 4.91) and perceived stress ($\beta = -0.19$, $t = -2.22$, $p = 0.03$) was significantly associated with the self-concept total scores. Adding the perceived social support factor contributed to an additional 7% of the variance in the self-concept total scores (F change = 10.55), and perceived social support ($\beta = 0.26$, $t = 3.25$, $p = 0.00$) was significantly associated with the self-concept total scores. Finally, adding the positive and negative coping factors contributed to an additional 20% of the variance in the self-concept total scores (F change = 21.00). Positive ($\beta = 0.50$, $t = 5.75$, $p = 0.00$) and negative coping ($\beta = -0.45$, $t = -5.33$, $p = 0.00$) were significantly associated with the self-concept total scores.

Table 4. Hierarchical linear regression analysis of the relationships among perceived stress, perceived social support, coping style factors, and self-concept total scores

		β	t	p	F change	R ²	R ² change
Step 1					2.46	0.07	0.07
	Gender	-0.08	-0.98	0.33			
	Age	-0.19	-2.16	0.03			
	Family economic status	0.10	1.10	0.27			
	Family structure	0.11	1.31	0.19			
Step 2					4.91	0.10	0.03
	Gender	-0.10	-1.17	0.24			
	Age	-0.12	-1.37	0.17			
	Family economic status	0.10	1.19	0.24			
	Family structure	0.10	1.14	0.26			
	Perceived stress	-0.19	-2.22	0.03			
Step 3					10.55	0.17	0.07
	Gender	-0.11	-1.36	0.18			
	Age	0.13	-1.55	0.12			
	Family economic status	0.06	0.73	0.47			
	Family structure	0.09	1.16	0.25			
	Perceived stress	-0.18	-2.12	0.04			
	Perceived social support	0.26	3.25	0.00			
Step 4					21.00	0.37	0.20
	Gender	-0.13	-1.76	0.08			
	Age	-0.15	-1.98	0.05			
	Family economic status	0.05	0.64	0.52			
	Family structure	0.07	0.91	0.36			
	Perceived stress	-0.17	-2.20	0.03			
	Perceived social support	0.15	2.06	0.04			
	Positive coping	0.50	5.75	0.00			

	Negative coping	-0.45	-5.33	0.00
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Discussion

This study was the first to explore the factors which influence self-concept among adolescents in China infected with HIV. We selected a group of HIV-infected adolescents, and analyzed the risk and protective factors. The purpose of this study was to determine whether perceived stress, perceived social support, and coping style are related to the self-concept of adolescents with HIV. The overall results confirmed that age, perceived stress, perceived social support, and coping style factors were associated with self-concept in adolescents with HIV. Specifically, younger age, lower perceived stress, and lower levels of negative coping were associated with higher levels of self-concept among adolescents with HIV. Conversely, higher perceived social support and more positive coping were positively correlated with the self-concept of adolescents with HIV. These findings highlight the significance of these factors on the self-concept of adolescents with HIV.

Our results showed that age significantly influenced the self-concept of adolescents with HIV. Developmental psychology has shown that the children's self-concept changes dramatically during adolescence and increases significantly with age [36].

Our findings showed that the older the adolescents with HIV, the lower the level of self-concept. We concluded that for this group of adolescents, with age, some drop out of school due to illness, face the change in the behavior of their parents, and even death. Adolescents lose confidence as part of their experience of disease along with

327 increased social stress, thus older adolescents with HIV have lower self-concept
328 levels.

329 Our findings showed that perceived stress is negatively related to self-concept in
330 adolescents with HIV. This finding was similar to previous studies. At present, there
331 was no research on the relationship between self-concept and perceived stress of
332 adolescents with HIV. Civitci et al.[37] and Hoffman et al. [38] report high negative
333 correlations between self-concept and perceived stress in adolescents. A study in
334 China also showed that the intensity of perceived stress was significantly correlated
335 with the level of self-concept, which was consistent with the results of our study
336 conducted in adolescents with HIV [39]. Because of the lethality of AIDS and
337 disease-related social discrimination, people with HIV are often subject to great
338 psychological stress [40 41]. Adolescents with HIV not only face the long-term
339 psychological pain of losing parents, but also continue to face a variety of external
340 stressors. These causes can lead to higher perceived stress of adolescents with HIV
341 than experienced by healthy adolescents, thus their self-concept tends to be low.
342 Therefore, in the education of families and schools with HIV-infected adolescents, we
343 should teach them how to best manage and deal with stress, and how to increase their
344 level of self-concept. We should mainly encourage them to develop their ability to
345 resist pressure and self-regulation. The society should provide HIV-infected
346 adolescents with social support from a professional psychological perspective.

347 We found that perceived social support was positively related to self-concept among
348 adolescents infected with HIV. The existing literature also suggests that adolescents

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infected with HIV who receive more perceived social support report higher levels of self-concept. A survey involving 21 HIV-positive patients in a southern U.S. city reported that a high level of self-concept largely depends on positive social support and interactions [42]. In a 5-year follow-up longitudinal study, Haven et al. found that the greater the perceived social support among adolescents infected with HIV, the higher the psychological adaptation and the higher the self-concept. An international study showed that social support from teachers, classmates, and parents increases the self-concept of HIV-infected adolescents [43]. This was consistent with the findings of our study. In some areas, HIV knowledge is not adequate, and HIV-infected adolescents are often subjected to discrimination and indifference from others, resulting in their fear of being rejected. As a result, HIV-infected adolescents lose self-confidence and their sense of self-concept. Support and care from teachers, classmates, and parents play important roles on the sense of self-concept in HIV-infected adolescents. Therefore, we should increase awareness of how to treat and manage AIDS patients. We should encourage HIV-infected adolescents to interact with others, enhance self-confidence, and actively participate in social activities.

Correlation analyses showed that there was a significant positive correlation between self-concept, positive coping style, and problem-solving among HIV-infected adolescents, which was negatively correlated with negative coping style, such as escape, withdrawal, and inferiority. There are many studies that confirm our conclusion. Pala et al. [44] reported that individuals with active coping strategies

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4 371 acquire a high self-concept, whereas individuals with passive-avoidant coping styles
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6 372 will have low self-esteem. In a northern California adolescent sample,
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9 373 Mantzicopoulos et al. [45] found that high self-concept was correlated with
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11 374 active-positive coping styles. HIV-infected adolescents are a specific group and they
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14 375 face many more pressures than healthy adolescents. Such pressures will necessitate
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17 376 facing problems, which may result in a negative coping style, such as escapism. The
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20 377 development of a long-term negative coping style is associated with a variety of
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22 378 psychological problems, which affect ones' own evaluation and understanding.
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25 379 Therefore, the development of positive or negative coping style for self-concept is
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27 380 very important. HIV-infected adolescents should be encouraged to adopt positive and
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30 381 active coping strategies which will improve self-confidence, the ability to face
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32 382 setbacks, and self-concept.
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36 383 We identified four factors which influence the self-concept of HIV-infected
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38 384 adolescents and discussed two aspects of the risk and protective factors, so that future
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41 385 work can develop a two-way intervention. Our findings suggest that we should
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44 386 provide more social support to adolescents so that they can cope with difficulties in a
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46 387 positive way and reduce their feelings of stress, which may contribute to development
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48 388 of the self-concept.
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51 389 **Study Limitations**

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55 390 Some limitations of this study must be acknowledged. First, the sample size of this
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58 391 study was small. HIV-infected adolescents reside in widely dispersed areas. The
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survey was conducted in a county of China in Henan province where HIV-infected adolescents are relatively concentrated. Therefore, the findings of the survey can only represent the self-concept of adolescents infected with HIV, but does not represent the entire Henan province or even the entire country. Second, this study was a cross-sectional survey. After investigating the self-concept of HIV-infected adolescents, we also investigated the perceived stress, social support, and coping styles of adolescents infected with HIV. This study only analyzed the relevance between HIV-infected adolescents and self-concept, and cannot explain the deeper causal relationship among variables; further research and analysis are warranted for validation. Third, the assessment of self-concept was carried out using the scale evaluation method, and for HIV-infected adolescents the differences in individual language and verbal cognitive abilities may interfere with the final findings. Fourth, the adolescents we surveyed were all infected from mother-to-child transmission. This may not be representative of the self-consciousness of all HIV-infected adolescents.

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415 **Contributors**

416 YJY and SYK conceived and designed the study, supervised the analysis, and
417 interpreted the data. XXY and XHQ supervised the analysis, interpreted the data, and
418 wrote the preliminary manuscript. ZXQ and LW supervised the data collection by
419 JWZ, WBW, and YWC. SYK performed the test administration, compiled the data,
420 and wrote the preliminary manuscript. All authors contributed to the writing and
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427 **Competing interests**

428 The authors declare that there are no competing or potential conflicts of interest. No
429 conflict of interest exists in the submission of the manuscript, and the manuscript was
430 approved by all authors for publication. The work described is original research that
431 has not been published previously, and is not under consideration for publication
432 elsewhere, in whole or in part.

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Ethical considerations

The research was conducted in accordance with the ethical guidelines of the Declaration of Helsinki and was approved by the Ethics Committee of Harbin Medical University. All participants provided written informed consent having after being informed of the research purpose, meaning, and content. All the adolescents participated voluntarily.

Data sharing statement

No additional data are available.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4-7
Methods			
Study design	4	Present key elements of study design early in the paper	8-9
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	9
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	9
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	9
Bias	9	Describe any efforts to address potential sources of bias	8

Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	10-11
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	12
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	13
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	14
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	15-16
		(b) Report category boundaries when continuous variables were categorized	

		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	19
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	17
Generalisability	21	Discuss the generalisability (external validity) of the study results	18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	21

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Factors influencing self-concept among adolescents infected with HIV: A cross-sectional survey in China

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Keywords:	adolescence, self consciousness, AIDS, Hierarchical regression analysis

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1 Factors influencing self-concept among adolescents infected with HIV: A cross-
2 sectional survey in China

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9 **Abstract**

10 Overview The mental health problems of HIV-infected adolescents are important. It is
11 of great significance to explore which factors can affect the self-evaluation and
12 understanding of HIV-infected adolescents.

13 Objective We found that HIV-infected adolescents have much less self-concept than
14 healthy adolescents. This study aimed to determine the factors influencing self-concept
15 among human immunodeficiency virus (HIV) infected adolescents in China.

16 Setting A questionnaire was distributed among two groups totaling to 290 adolescents
17 in Henan Province, China. One hundred forty questionnaires were distributed in the
18 case group (HIV-infected adolescents) and the control group (healthy adolescents) was
19 issued 150 questionnaires.

20 The Piers-Harris Children's Self-concept Scale, the Perceived Stress Scale, the

Perceived Social Support Scale, and the Simplified Coping Style Questionnaire were adapted for a Chinese population. Differences between the groups were tested for significance using the Student's t-test, and ANOVA was used to test continuous variables. The relationship between environmental personality factors and adolescent self-concept was examined by Pearson correlation analysis. Hierarchical linear regression analysis was used to model the effects of environmental personality factors on self-concept.

Results The self-concept total score among HIV-infected adolescents was significantly lower than normal adolescents ($p < 0.05$). Hierarchical regression analysis indicated that age ($\beta = -0.19$, $t = -2.16$, $p = 0.03$), perceived stress ($\beta = -0.19$, $t = -2.22$, $p = 0.03$), perceived social support ($\beta = 0.26$, $t = 3.25$, $p = 0.00$), positive coping ($\beta = 0.50$, $t = 5.75$, $p = 0.00$), and negative coping ($\beta = -0.45$, $t = -5.33$, $p = 0.00$) were significantly associated with self-concept total scores.

Conclusions The self-concept of HIV-infected adolescents is related to perceived stress, perceived social support, and coping style. These findings underline the significance of self-concept among adolescents infected with HIV.

Strengths and limitations of this study

1. This is the first study to determine the factors influencing self-concept among HIV-infected adolescents in China.
2. Although HIV-infected adolescents are a special group, the sample size was suitably powered to allow statistical analysis including hierarchical linear regression.

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3. This was a cross-sectional study and thus causal relationships between the self-
concept of HIV-infected adolescents and influencing factors require further exploration.

Keywords: adolescence; self-consciousness; AIDS; Hierarchical regression analysis

Introduction

Over the years, AIDS has spread throughout the world at an extremely rapid rate. In 1985, AIDS began to prevail in a few African countries. By 2005, AIDS had affected nearly all countries and regions worldwide[1]. As a result of AIDS, the mortality rate of the adult population has increased significantly[2]. HIV is spread through exposure to HIV-infected blood or other body fluids. The primary transmission modes include contact with an infected person’s body fluids during unprotected sex, blood-to-blood exposure (either by direct contact or through needle sharing among injection drug users), and perinatal transmission from infected mother-to-child. The main target of mother-to-child transmission of AIDS is children and adolescents and the inevitable consequence is that a large number of adolescents lose their parents because of AIDS. The typical socioeconomic status of families and individuals in communities with a high incidence of AIDS means that those adolescents who have acquired AIDS through mother-to-child transmission have a visible vulnerability in terms of physical, psychological, and social adaptation[3]. At present, the number of HIV-infected adolescents in China is large and rapidly increasing. Living conditions, social environment, and mental health difficulties are serious problems that have had an enormous impact on the growth and development of HIV-infected adolescents. The

study of Qian and Wang in China in 2007 reported that prejudice and discrimination have a substantial negative impact on the health of HIV-infected adolescents[4]. The mental health difficulties experienced by the children who lost their parents to HIV/AIDS are mainly due to decrease in self-concept and increase in depression[5-7]. All the difficulties described above impact on self-concept among HIV-infected adolescents, and we predict that self-concept in HIV-infected adolescents is lower than in healthy adolescents.

Self-concept is a cognitive assessment of one's own abilities and weaknesses[8] and plays an important role in mental health. Low levels of self-concept are a risk factor of mental health problems. High levels of self-concept are considered to be a protective factor that hinders the development of psychological problems and promotes general health[9-12]. Susan Harter proposed a multi-dimensional model of self-concept from the perspective of developmental psychology and believed that adolescence was a critical period for the development of self-concept[13]. An individual's perception of himself/herself changes significantly during adolescence, or even undergoes a dramatic reversal[14]. In the early stages of puberty, adolescents are more likely to compare themselves with others, and to understand the comparisons and judgment of others to themselves. Adolescents also begin to give higher value to these judgments[15]. Social psychology studies have shown that during and after puberty, children become more self-conscious, more receptive, and more concerned about the opinions of others[16 17]. One developmental psychology study has shown that during and after puberty, an adolescent's self-evaluation becomes more comprehensive and changes from that held

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85 previously[18]. Previous studies have shown that specific groups of adolescents may
86 be vulnerable to lower levels of self-concept than found in normal groups. For example,
87 studies of adolescents with chronic diseases have shown that their level of self-concept
88 is significantly lower than healthy adolescents. Adolescents with chronic diseases often
89 feel insecure, lonely, isolated, and controlled by changes resulting from chronic
90 disease[19 20]. Therefore, we suggest that chronic diseases such as AIDS, will have a
91 serious impact on the self-concept of adolescents. To date, no studies have investigated
92 the self-concept of Chinese HIV-infected adolescents. In China, HIV-infected
93 adolescents represent a large but specific group who have experienced multiple losses
94 throughout their lives, thus increasing their risk of psychopathology[21]. Therefore,
95 studying the development of self-concept among HIV-infected adolescents, and
96 identifying methods to help them maintain psychological well-being and healthy
97 growth is of clear importance.

98 The formation and development of self-concept is influenced by many factors. It has
99 been shown that teacher-student relationships, peer relationships, parent-child
100 relationships, parenting patterns, perceived stress, perceived social support, and
101 individual coping styles, are all likely to have an impact on self-concept among
102 adolescents[22]. The current study explored the factors which influence the self-
103 concept of HIV-infected adolescents, focusing on both risk and protective factors, and
104 external environment-individual internal characteristics.

105 A large amount of research data suggest that factors such as perceived stress and
106 perceived social support in the external environment have a significant impact on the

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4 107 formation and development of self-concept. Perceived stress is the result of the
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6 108 perceptual assessment of an individual's own experience of stress resulting from
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9 109 specific situations or events[23]. People have different perceptions about events that
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11 110 occur, and their psychological response differs. Differences in psychological response
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13 111 will have different effects on mental health. In Africa, the incidence of AIDS is
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15 112 extremely high and adolescents are often in a high-crime and precarious
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17 113 environment[24]. Such an environment may aggravate their sense of pressure, and thus
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19 114 affect their self-concept.
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25 115 Social support is considered to be an important factor affecting psychological stress and
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27 116 physical health. From a psychological perspective, Cobb suggests that social support
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29 117 includes the following: emotional support; respect and support; and member
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31 118 attribution[25]. Social support can significantly predict the emotional behavior of
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33 119 adolescents, and higher social support has a protective effect on adolescent mental
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35 120 health[26]. Researchers have shown that the relationship between social support and
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37 121 self-concept is stable and positively correlated. There is a difference between social
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39 122 support factors and the correlation between the fractal dimensions of self-concept.
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41 123 Social support for adolescents is primarily derived from parents, teachers, classmates,
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43 124 and friends. Michelle et al.[27] report that the relationship between the frequency of
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45 125 social support and self-concept is significant. Rubin et al.[28] have shown that social
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47 126 support may prevent teenagers with LD (learning disabilities) from mood disorders. LD
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49 127 adolescents who receive more social support from their parents, teachers, and peers,
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51 128 have higher levels of self-concept than adolescents who receive less social support[29].
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Barroso[30] concluded that social support is an important factor for adults who are long-term survivors of AIDS. Lack of social support may also cause HIV-infected adolescents to have lower levels of self-concept. Cluver et al.[31] report that orphans in particular may have a lack of social support due to illness or death of family members, thereby distorting their cognitions about themselves and others.

An adolescent's self-concept is not only affected by external environmental factors, but their own internal factors. Individual coping styles and other factors have a significant impact on the emergence and development of self-concept. Coping style refers to the change in cognition and/or or behavior utilized by an individual in a particular stressful situation, with the aim of managing emotions and improving the problem[32]. Individuals adopt specific coping styles and measures according to their own experiences after cognitive assessment of the response process. Coping style has an important impact on the status of an individual's environmental adaptation and mental health[33]. At present, an important research aspect in clinical psychology is the study of the relationship between an individual's coping style, and physical and mental health. Xinyi HU et al.[34] have shown that the clarity of self-awareness or self-concept is related to more active coping behavior. Studies of HIV-infected individuals and their coping styles suggest that a high level of active coping is positively related to immunization measures, and may indirectly affect the self-concept of the AIDS patient [35].

This study was designed to explore the factors which influence the self-concept of HIV-infected adolescents. We investigated the self-concept of HIV-infected adolescents,

considered the environmental and individual levels, and analyzed the relationship between perceived stress, perceived social support, and coping style, and self-concept, in order to better understand the role of self-concept among HIV-infected adolescents. We believe this is the first study of this kind in China.

Methods

Sample size and sampling technique

The current study was conducted in a rural county in Henan province, China, where many residents were infected with HIV through blood collection using inadequate hygiene techniques. This rural county has the highest prevalence of HIV infection in the area. We obtained village-level HIV surveillance data from the anti-epidemic station in each of the counties to identify the villages with the highest number of AIDS-related deaths and confirmed HIV infections. The adolescents we surveyed were all infected by mother-to-child transmission of HIV.

A questionnaire was distributed among two groups of adolescents; 140 questionnaires were distributed in the case group (HIV-infected adolescents) and 139 valid questionnaires were returned (response rate of 99.3%). Among the adolescents in the case group, there were 88 boys (63.3%) and 51 girls (36.7%), and the average age was 15.89 ± 2.8 years. The control group (healthy adolescents) was issued 150 questionnaires, and 144 valid questionnaires were returned (response rate of 96.0%). Among the adolescents in the control group, there were 91 boys (63.2%) and 53 girls (36.8%), and the average age was 13.85 ± 1.2 years. The total number of participants

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in this study was therefore 283 adolescents aged 10–20 years and of Han ethnicity.

Participation of the adolescents was voluntary, and all provided informed consent.

Procedure

To recruit HIV-infected adolescents, we worked with the town leaders to generate lists of adolescents with confirmed diagnoses of HIV/AIDS. We approached the adolescents on the lists and invited them to participate in the study. After the eligibility of an adolescent was confirmed, the interviewer(s) provided him/her with a detailed description of the study design, potential benefits and risks, confidentiality issues and invited him/her to participate. When an adolescent agreed to be included in the study, the parents of the person were invited to participate by means of letters.

HIV-infected adolescents 10–20 years of age (inclusive) comprised the case group. The healthy children in Shangcai county who were not infected with HIV were compared as the control group. The parents are healthy and the family is complete. Inclusion criteria: age 10-20 years old; It does not meet the definition of children with HIV infection in this study; In the first half of the investigation, the children have been living in Shangcai county. The exclusion criteria were: unconfirmed HIV infection status; The body is unable to participate in severe diseases and cannot participate due to central nervous system problems (such as encephalopathy, epilepsy, etc.).

The research met ethical guidelines according the to the Declaration of Helsinki, and approval was granted by the Ethics Committee of Harbin Medical University. All participants signed informed consent forms after receiving explanations of the research

purpose, meaning, and content. All of the adolescents participated voluntarily. If a child had lost both parents (orphans), we obtained the informed consent of the himself and his guardian.

Patient and Public Involvement

Self-concept is a cognitive assessment of one's own abilities and weaknesses. Self-concept itself is the subjective and internal evaluation of one's self. Therefore, we selected the Piers-Harris Children's Self-concept Scale to measure their self-concept, without the influence of subjective preference on the results. We will send the results to the local CDC in the form of email after we get the results. The CDC informs participants by phone.

Measures

Outcome measures

The Piers-Harris Children's Self-concept Scale is a paper-and-pencil test consisting of 80 items which are scored as true or false. The items are self-descriptive declarative statements. The scores range from 1–80; higher scores indicate higher levels self-concept. The statements are worded in both positive and negative language to control for social desirability responding. The scale has good reliability and validity and the Cronbach's alpha of the scale was 0.858 in the current study.

Stress related to interpersonal stressors was assessed by the Perceived Stress Scale. The scale consists of ten items. Each item has a score range of 0–4, with a possible total score of 40 overall. Higher scores indicate higher levels of stress. The internal

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consistency measured by Cronbach’s alpha in this study was 0.847.

The Perceived Social Support Scale (PSSS), developed by Zimet et al. consists of 12 items that were revised from three subscales (family, friend, and other support). Participants responded to the items on a 7-point Likert-type scale indicating disagreement/agreement. Each item was divided into a total score for social support. Items were adjusted to be more appropriate for HIV-infected children in the current study. The items "leaders, relatives and colleagues" were changed to "teachers, relatives and students. Cronbach’s alpha was 0.887 in this study. We used the Simplified Coping Style Questionnaire (SCSQ) to measure coping style. The SCSQ includes 20 items that contain two dimensions of coping (positive and negative). Each dimension consists of 10 items, and each item is scored on a 5-point scale, where 1 indicates ‘certainly not’ and 5 indicates ‘certainly.’ A higher score on one dimension indicates that the individual is more likely to utilize this type of coping style. The questionnaire is highly reliable and suitable for a Chinese population. The Cronbach’s alpha for the two independent dimensions of coping were 0.70 and 0.69.

Data analysis

The Statistical Package for Social Sciences 19.0 (SPSS 19.0) program (IBM, Armonk, NY, USA) was used for statistical analysis. All tests were two-tailed and the significance level was set at a $p < 0.05$. Differences between the groups were tested using the Student’s t-test and ANOVA was used to test continuous variables. The relationship between environmental personality factors and adolescent self-concept was

examined with Pearson correlation analyses. Hierarchical linear regression analysis was used to model the effects of environmental personality factors on self-concept in adolescents. In the regression model, gender, age, family economic status, and family structure were entered in the first block to control for potential confounding variables. In the second block, perceived stress factors were entered into the model. Third, after controlling for sociodemographic variables and perceived stress factors, perceived social support was entered into the model. Finally, after controlling for sociodemographic variables, perceived stress factors, and perceived social support, coping style was entered into the model.

Results

Study population

Adolescents were asked to report on individual and family characteristics including age, gender, family economic status (i.e., good, moderate, and poor), and family structure (intact/non-intact).

Comparison of self-concept between the Case group and control group

The self-concept levels of HIV-infected adolescents were significantly lower than healthy adolescents ($p < 0.05$; Table 1).

Table 1. Comparison of the levels of self-concept between HIV-infected and control adolescents

HIV-infected adolescents	Healthy adolescents	t	p
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	(N = 139)	(N = 144)		
Self-concept score	51.55	60.22	-9.37	0.00**

Sociodemographic data and self-concept total scores by different sociodemographic variables

Of the 139 participants, 88 were males and 51 were females. The number of participants in each age group was as follows: 8–13 years, 28; 13–16 years, 80; and 16–18 years, 31. The family economic status was as follows: good, 48; moderate, 79; and poor, 12. Fifty-seven and eighty-two HIV-infected adolescents did and did not have an intact family structure, respectively. No significant differences in self-concept total scores existed between gender, age, family economic status, or family structure (Table 2).

Table 2. Participants’ socio-demographic data and self-concept total scores by socio-demographic variables

	Group	N (%)	Self-concept score	F/t	p
Gender				0.08	0.78
	Male	88 (63.3)	52.08 ± 10.71		
	Female	51 (36.7)	50.65 ± 11.27		
Age				1.44	0.24
	8-13	28 (20.1)	53.43 ± 11.86		
	13-16	80 (57.6)	50.21 ± 10.67		
	16-18	31 (22.3)	53.32 ± 10.44		
Family economic status				2.74	0.07

	Good	48 (34.5)	50.46 ± 10.03		
	Moderate	79 (56.8)	51.18 ± 11.38		
	Poor	12 (8.6)	58.42 ± 10.90		
Family structure				0.18	0.67
	Intact	82 (59.0)	52.63 ± 10.46		
	Non-intact	57 (41.0)	50.00 ± 11.42		

Relationship between perceived stress, perceived social support, coping style factors, and self-concept total scores

We collected self-concept total scores for perceived stress, perceived social support, and coping style factors in HIV-infected adolescents (Table 3). Statistically significant linear relationships existed among perceived stress, perceived social support, coping style factors, and the self-concept total scores of HIV-infected adolescents ($p < 0.05$). Among these variables, perceived stress ($r = -0.23$, $p < 0.05$) and negative coping ($r = -0.26$, $p < 0.05$) were negatively related to the self-concept total scores. Conversely, perceived social support ($r = 0.28$, $p < 0.05$) and positive coping ($r = 0.25$, $p < 0.05$) were positively associated with self-concept total scores.

Table 3. Correlations among perceived stress, perceived social support, coping style factors, and self-concept total scores

	Perceived stress	Perceived social support	Positive coping	Negative coping
Self-concept	-0.23**	0.28**	0.25**	-0.26**

Hierarchical linear regression analysis of the relationship among perceived stress, perceived social support, coping style factors, and self-concept total scores

Eight variables accounted for 37.0% of the total variance of the self-concept total scores (Table 4). The control variables accounted for 7% of the variance in the self-concept total scores (F change = 2.46), and among the control variables, age ($\beta = -0.19$, $t = -2.16$, $p = 0.03$) was significantly associated with the self-concept total scores. With inclusion of the perceived stress variable, the variance which could be explained increased to 10%. The variance in self-concept total scores (F change = 4.91) and perceived stress ($\beta = -0.19$, $t = -2.22$, $p = 0.03$) was significantly associated with the self-concept total scores. Adding the perceived social support factor contributed to an additional 7% of the variance in the self-concept total scores (F change = 10.55), and perceived social support ($\beta = 0.26$, $t = 3.25$, $p = 0.00$) was significantly associated with the self-concept total scores. Finally, adding the positive and negative coping factors contributed to an additional 20% of the variance in the self-concept total scores (F change = 21.00). Positive ($\beta = 0.50$, $t = 5.75$, $p = 0.00$) and negative coping ($\beta = -0.45$, $t = -5.33$, $p = 0.00$) were significantly associated with the self-concept total scores.

Table 4. Hierarchical linear regression analysis of the relationships among perceived stress, perceived social support, coping style factors, and self-concept total scores

	β	t	p	F change	R ²	R ² change
Step 1				2.46	0.07	0.07
Gender	-0.08	-0.98	0.33			
Age	-0.19	-2.16	0.03			

Step 2	Family economic status	0.10	1.10	0.27			
	Family structure	0.11	1.31	0.19			
					4.91	0.10	0.03
	Gender	-0.10	-1.17	0.24			
	Age	-0.12	-1.37	0.17			
Step 3	Family economic status	0.10	1.19	0.24			
	Family structure	0.10	1.14	0.26			
	Perceived stress	-0.19	-2.22	0.03			
					10.55	0.17	0.07
	Gender	-0.11	-1.36	0.18			
Step 4	Age	0.13	-1.55	0.12			
	Family economic status	0.06	0.73	0.47			
	Family structure	0.09	1.16	0.25			
	Perceived stress	-0.18	-2.12	0.04			
	Perceived social support	0.26	3.25	0.00			
					21.00	0.37	0.20
	Gender	-0.13	-1.76	0.08			
	Age	-0.15	-1.98	0.05			
	Family economic status	0.05	0.64	0.52			
	Family structure	0.07	0.91	0.36			
	Perceived stress	-0.17	-2.20	0.03			
	Perceived social support	0.15	2.06	0.04			
	Positive coping	0.50	5.75	0.00			
	Negative coping	-0.45	-5.33	0.00			

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301 Discussion

302 This study was the first to explore the factors which influence self-concept among

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adolescents in China infected with HIV. We selected a group of HIV-infected adolescents, and analyzed the risk and protective factors. The purpose of this study was to determine whether perceived stress, perceived social support, and coping style are related to the self-concept of adolescents with HIV. The overall results confirmed that age, perceived stress, perceived social support, and coping style factors were associated with self-concept in adolescents with HIV. Specifically, younger age, lower perceived stress, and lower levels of negative coping were associated with higher levels of self-concept among adolescents with HIV. Conversely, higher perceived social support and more positive coping were positively correlated with the self-concept of adolescents with HIV. These findings highlight the significance of these factors on the self-concept of adolescents with HIV.

Our results showed that age significantly influenced the self-concept of adolescents with HIV. Developmental psychology has shown that the children's self-concept changes dramatically during adolescence and increases significantly with age[36]. Our findings showed that the older the adolescents with HIV, the lower the level of self-concept. We concluded that for this group of adolescents, with age, some drop out of school due to illness, face the change in the behavior of their parents, and even death. Adolescents lose confidence as part of their experience of disease along with increased social stress, thus older adolescents with HIV have lower self-concept levels.

Our findings showed that perceived stress is negatively related to self-concept in adolescents with HIV. This finding was similar to previous studies. At present, there was no research on the relationship between self-concept and perceived stress of

adolescents with HIV. Civitci et al.[37] and Hoffman et al.[38] report high negative correlations between self-concept and perceived stress in adolescents. A study in China also showed that the intensity of perceived stress was significantly correlated with the level of self-concept, which was consistent with the results of our study conducted in adolescents with HIV[39]. Because of the lethality of AIDS and disease-related social discrimination, people with HIV are often subject to great psychological stress[40 41]. Adolescents with HIV not only face the long-term psychological pain of losing parents, but also continue to face a variety of external stressors. These causes can lead to higher perceived stress of adolescents with HIV than experienced by healthy adolescents, thus their self-concept tends to be low. Therefore, in the education of families and schools with HIV-infected adolescents, we should teach them how to best manage and deal with stress, and how to increase their level of self-concept. We should mainly encourage them to develop their ability to resist pressure and self-regulation. The society should provide HIV-infected adolescents with social support from a professional psychological perspective.

We found that perceived social support was positively related to self-concept among adolescents infected with HIV. The existing literature also suggests that adolescents infected with HIV who receive more perceived social support report higher levels of self-concept. A survey involving 21 HIV-positive patients in a southern U.S. city reported that a high level of self-concept largely depends on positive social support and interactions[42]. In a 5-year follow-up longitudinal study, Haven et al. found that the greater the perceived social support among adolescents infected with HIV, the higher

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the psychological adaptation and the higher the self-concept. An international study showed that social support from teachers, classmates, and parents increases the self-concept of HIV-infected adolescents[43]. This was consistent with the findings of our study. In some areas, HIV knowledge is not adequate, and HIV-infected adolescents are often subjected to discrimination and indifference from others, resulting in their fear of being rejected. As a result, HIV-infected adolescents lose self-confidence and their sense of self-concept. Support and care from teachers, classmates, and parents play important roles on the sense of self-concept in HIV-infected adolescents. Therefore, we should increase awareness of how to treat and manage AIDS patients. We should encourage HIV-infected adolescents to interact with others, enhance self-confidence, and actively participate in social activities.

Correlation analyses showed that there was a significant positive correlation between self-concept, positive coping style, and problem-solving among HIV-infected adolescents, which was negatively correlated with negative coping style, such as escape, withdrawal, and inferiority. There are many studies that confirm our conclusion. Pala et al.[44] reported that individuals with active coping strategies acquire a high self-concept, whereas individuals with passive-avoidant coping styles will have low self-esteem. In a northern California adolescent sample, Mantzicopoulos et al.[45] found that high self-concept was correlated with active-positive coping styles. HIV-infected adolescents are a specific group and they face many more pressures than healthy adolescents. Such pressures will necessitate facing problems, which may result in a negative coping style, such as escapism. The development of a long-term negative

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4 369 coping style is associated with a variety of psychological problems, which affect ones'
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7 370 own evaluation and understanding. Therefore, the development of positive or negative
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9 371 coping style for self-concept is very important. HIV-infected adolescents should be
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12 372 encouraged to adopt positive and active coping strategies which will improve self-
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14 373 confidence, the ability to face setbacks, and self-concept.

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17 374 We identified four factors which influence the self-concept of HIV-infected adolescents
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19 375 and discussed two aspects of the risk and protective factors, so that future work can
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21 376 develop a two-way intervention. Our findings suggest that we should provide more
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23 377 social support to adolescents so that they can cope with difficulties in a positive way
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25 378 and reduce their feelings of stress, which may contribute to development of the self-
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33 380 **Study Limitations**

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37 381 Some limitations of this study must be acknowledged. First, the sample size of this
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39 382 study was small. HIV-infected adolescents reside in widely dispersed areas. The survey
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41 383 was conducted in a county of China in Henan province where HIV-infected adolescents
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43 384 are relatively concentrated. Therefore, the findings of the survey can only represent the
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45 385 self-concept of adolescents infected with HIV, but does not represent the entire Henan
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47 386 province or even the entire country. Second, this study was a cross-sectional survey.
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49 387 After investigating the self-concept of HIV-infected adolescents, we also investigated
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51 388 the perceived stress, social support, and coping styles of adolescents infected with HIV.
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53 389 This study only analyzed the relevance between HIV-infected adolescents and self-
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concept, and cannot explain the deeper causal relationship among variables; further research and analysis are warranted for validation. Third, the assessment of self-concept was carried out using the scale evaluation method, and for HIV-infected adolescents the differences in individual language and verbal cognitive abilities may interfere with the final findings. Fourth, the adolescents we surveyed were all infected from mother-to-child transmission. This may not be representative of the self-consciousness of all HIV-infected adolescents.

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Contributors

YJY and SYK conceived and designed the study, supervised the analysis, and interpreted the data. XXY and XHQ supervised the analysis, interpreted the data, and wrote the preliminary manuscript. ZXQ, XJS and EYZ supervised the data collection

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38 422 has not been published previously, and is not under consideration for publication
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41 423 elsewhere, in whole or in part.
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43 424 **Ethical considerations**

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47 425 The research was conducted in accordance with the ethical guidelines of the Declaration
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49 426 of Helsinki and was approved by the Ethics Committee of Harbin Medical University.
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52 427 All participants provided written informed consent having after being informed of the
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55 428 research purpose, meaning, and content. All the adolescents participated voluntarily.
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58 429 **Data sharing statement**

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No additional data are available.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4-7
Methods			
Study design	4	Present key elements of study design early in the paper	8-9
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	9
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	9
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	9
Bias	9	Describe any efforts to address potential sources of bias	8

Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	10-11
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	12
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	13
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	14
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	15-16
		(b) Report category boundaries when continuous variables were categorized	

		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	19
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	17
Generalisability	21	Discuss the generalisability (external validity) of the study results	18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	21

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Factors influencing self-concept among adolescents infected with HIV: A cross-sectional survey in China

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1 Factors influencing self-concept among adolescents infected with HIV: A
2 cross-sectional survey in China

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9 **Abstract**

10 Overview: The mental health problems of adolescents with human immunodeficiency
11 virus (HIV) are important. It is of great significance to explore which factors can
12 affect the self-evaluation and understanding of adolescents with HIV.

13 Objective: We found that adolescents with HIV have a lower level of self-concept
14 than healthy adolescents. This study aimed to determine the factors influencing
15 self-concept among adolescents with HIV in China.

16 Setting: A questionnaire was distributed among a total of 290 adolescents in Henan
17 Province, China. One hundred and forty questionnaires were distributed in the case
18 group (adolescents with HIV) and the control group (healthy adolescents) was issued
19 150 questionnaires.

20 The Piers-Harris Children's Self-concept Scale, the Perceived Stress Scale, the

Perceived Social Support Scale, and the Simplified Coping Style Questionnaire were adapted for a Chinese population. Differences between the groups were tested for significance using Student's t-test, and ANOVA was used to test continuous variables. The relationship between environmental personality factors and adolescent self-concept was examined by Pearson correlation analysis. Hierarchical linear regression analysis was used to model the effects of environmental personality factors on self-concept.

Results: The self-concept total score among adolescents with HIV was significantly lower than healthy adolescents ($p < 0.05$). Hierarchical regression analysis indicated that age ($\beta = -0.19$, $t = -2.16$, $p = 0.03$), perceived stress ($\beta = -0.19$, $t = -2.22$, $p = 0.03$), perceived social support ($\beta = 0.26$, $t = 3.25$, $p = 0.00$), positive coping style ($\beta = 0.50$, $t = 5.75$, $p = 0.00$), and negative coping style ($\beta = -0.45$, $t = -5.33$, $p = 0.00$) were significantly associated with self-concept total scores.

Conclusions: The self-concept of adolescents with HIV is related to perceived stress, perceived social support, and coping style. These findings underline the significance of self-concept among adolescents infected with HIV.

Strengths and limitations of this study

1. This is the first study to determine the factors influencing self-concept among adolescents with HIV in China.

2. Although adolescents with HIV are a special group, the sample size was suitably powered to allow statistical analysis including hierarchical linear regression.

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3. This was a cross-sectional study and thus causal relationships between the self-concept of adolescents with HIV and influencing factors require further exploration.

Keywords: adolescence; self-concept; AIDS; hierarchical regression analysis

Introduction

Over the years, AIDS has spread throughout the world at an extremely rapid rate. In 1985, AIDS began to spread in a few African countries. By 2005, AIDS had affected nearly all countries and regions worldwide[1]. As a result of AIDS, the mortality rate of the adult population has increased significantly[2]. HIV is spread through exposure to HIV-infected blood or other body fluids. The primary transmission modes include contact with an infected person’s body fluids during unprotected sex, blood-to-blood exposure (either by direct contact or through needle sharing among injection drug users), and perinatal transmission from infected mother to child. The main target of mother-to-child transmission of AIDS is children and adolescents and the inevitable consequence is that a large number of adolescents lose their parents because of AIDS. The typical socioeconomic status of families and individuals in communities with a high incidence of AIDS means that those adolescents who have acquired AIDS through mother-to-child transmission have a visible vulnerability in terms of physical, psychological, and social adaptation[3]. At present, the number of adolescents with HIV in China is large and rapidly increasing. Living conditions, social environment, and mental health difficulties are serious problems that have had an enormous impact

on the growth and development of adolescents with HIV. The study of Qian and Wang in China in 2007 reported that prejudice and discrimination have a substantial negative impact on the health of adolescents with HIV[4]. The mental health difficulties experienced by the children who lost their parents to HIV/AIDS are mainly due to a decrease in self-concept and an increase in depression[5-7]. All the difficulties described above impact on self-concept among adolescents with HIV, and we predict that self-concept in adolescents with HIV is lower than in healthy adolescents.

Self-concept is a cognitive assessment of one's own abilities and weaknesses[8] and plays an important role in mental health. Low levels of self-concept are a risk factor of mental health problems. High levels of self-concept are considered to be a protective factor that hinders the development of psychological problems and promotes general health[9-12]. Harter proposed a multi-dimensional model of self-concept from the perspective of developmental psychology and believed that adolescence was a critical period for the development of self-concept[13]. An individual's perception of himself/herself changes significantly during adolescence, or even undergoes a dramatic reversal[14]. In the early stages of puberty, adolescents are more likely to compare themselves with others, and to consider how they are perceived and judged by others. Adolescents also begin to give higher value to these judgments[15]. Social psychology studies have shown that during and after puberty, children become more self-conscious, more receptive, and more concerned about the opinions of others[16 17]. One developmental psychology study has shown that

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4 85 during and after puberty, an adolescent's self-evaluation becomes more
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6 86 comprehensive and changes from that held previously[18]. Previous studies have
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9 87 shown that specific groups of adolescents may be vulnerable to lower levels of
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12 88 self-concept than found in normal groups. For example, studies of adolescents with
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15 89 chronic diseases have shown that their level of self-concept is significantly lower than
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17 90 healthy adolescents. Adolescents with chronic diseases often feel insecure, lonely,
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20 91 isolated, and controlled by changes resulting from chronic disease[19 20]. Therefore,
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22 92 we suggest that chronic diseases such as AIDS, will have a serious impact on the
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25 93 self-concept of adolescents. To date, no studies have investigated the self-concept of
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28 94 Chinese adolescents with HIV. In China, adolescents with HIV represent a large but
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31 95 specific group who have experienced multiple losses throughout their lives, thus
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33 96 increasing their risk of psychopathology[21]. Therefore, studying the development of
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36 97 self-concept among adolescents with HIV, and identifying methods to help them
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38 98 maintain psychological well-being and healthy growth is of clear importance.
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41 99 The formation and development of self-concept is influenced by many factors. It has
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44 100 been shown that teacher-student relationships, peer relationships, parent-child
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47 101 relationships, parenting patterns, perceived stress, perceived social support, and
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49 102 individual coping styles, are all likely to have an impact on self-concept among
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52 103 adolescents[22]. The current study explored the factors which influence the
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55 104 self-concept of adolescents with HIV, focusing on both risk and protective factors,
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57 105 and external environment-individual internal characteristics.
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60 106 A large body of research suggests that factors such as perceived stress and perceived

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6 108 and development of self-concept. Perceived stress is the result of the perceptual
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9 109 assessment of an individual's own experience of stress resulting from specific
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11 110 situations or events[23]. People have different perceptions about events that occur,
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14 111 and their psychological response differs. Differences in psychological response will
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17 112 have different effects on mental health. In Africa, the incidence of AIDS is extremely
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19 113 high and adolescents are often in a high-crime and precarious environment[24]. Such
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28 116 Social support is considered to be an important factor affecting psychological stress
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30 117 and physical health. From a psychological perspective, Cobb suggests that social
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33 118 support includes the following: emotional support; respect and support; and member
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36 119 attribution[25]. Social support can significantly predict the emotional behavior of
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39 120 adolescents, and higher social support has a protective effect on adolescent mental
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41 121 health[26]. Researchers have shown that the relationship between social support and
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44 122 self-concept is stable and positively correlated. There is a difference between social
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47 123 support factors and the correlation between the fractal dimensions of self-concept.
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49 124 Social support for adolescents is primarily derived from parents, teachers, classmates,
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51 125 and friends. Michelle et al.[27] report that the relationship between the frequency of
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54 126 social support and self-concept is significant. Rubin et al.[28] have shown that social
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57 127 support may prevent teenagers with learning disabilities (LD) from mood disorders.
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59 128 adolescents with LD who receive more social support from their parents, teachers, and
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peers, have higher levels of self-concept than adolescents who receive less social support[29]. Barroso[30] concluded that social support is an important factor for adults who are long-term survivors of AIDS. Lack of social support may also cause adolescents with HIV to have lower levels of self-concept. Cluver et al.[31] report that orphans in particular may have a lack of social support due to illness or death of family members, thereby distorting their cognitions about themselves and others.

An adolescent's self-concept is not only affected by external environmental factors, but their own internal factors. Individual coping styles and other factors have a significant impact on the emergence and development of self-concept. Coping style refers to the change in cognition and/or behavior utilized by an individual in a particular stressful situation, with the aim of managing emotions and improving the problem[32]. Individuals adopt specific coping styles and measures according to their own experiences after cognitive assessment of the response process. Coping style has an important impact on the status of an individual's environmental adaptation and mental health[33]. At present, an important research aspect in clinical psychology is the study of the relationship between an individual's coping style, and physical and mental health. Xinyi et al.[34] have shown that the clarity of self-awareness or self-concept is related to more active coping behavior. Studies of HIV-infected individuals and their coping styles suggest that a high level of active coping is positively related to immunization measures, and may indirectly affect the self-concept of the AIDS patient [35].

This study was designed to explore the factors which influence the self-concept of

adolescents with HIV. We investigated the self-concept of adolescents with HIV, considered the environmental and individual levels, and analyzed the relationship between perceived stress, perceived social support, coping style, and self-concept, in order to better understand the role of self-concept among adolescents with HIV. We believe this is the first study of this kind in China.

Methods

Sample size and sampling technique

The current study was conducted in a rural county in Henan province, China, where many residents were infected with HIV through blood collection using inadequate hygiene techniques. This rural county has the highest prevalence of HIV infection in the area. We obtained village-level HIV surveillance data from the anti-epidemic station in each of the counties to identify the villages with the highest number of AIDS-related deaths and confirmed HIV infections. The adolescents we surveyed were all infected by mother-to-child transmission of HIV.

A questionnaire was distributed among two groups of adolescents; 140 questionnaires were distributed in the case group (adolescents with HIV) and 139 valid questionnaires were returned (response rate of 99.3%). Among the adolescents in the case group, there were 88 boys (63.3%) and 51 girls (36.7%), and the average age was 15.89 ± 2.8 years. The control group (healthy adolescents) was issued 150 questionnaires, and 144 valid questionnaires were returned (response rate of 96.0%). Among the adolescents in the control group, there were 91 boys (63.2%) and 53 girls

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(36.8%), and the average age was 13.85 ± 1.2 years. The total number of participants in this study was therefore 283 adolescents aged 10–20 years and of Han ethnicity. Participation of the adolescents was voluntary, and all provided informed consent.

Procedure

To recruit adolescents with HIV, we worked with the town leaders to generate lists of adolescents with confirmed diagnoses of HIV/AIDS. We approached the adolescents on the lists and invited them to participate in the study. We contacted the headmasters of local schools with the help of the Center for Disease Control and the Prevention(CDC) officer. The headmasters in each school called the adolescents with HIV together. To protect participants’ privacy, the headmasters worked with adolescents to come up with an individualized plan for assessment in terms of the preferable time and place for them to feel comfortable to meet with the researchers. After the eligibility of an adolescent was confirmed, the interviewer(s) provided him/her with a detailed description of the study design, potential benefits and risks, confidentiality issues and invited him/her to participate. On the premise of ensuring no harm to the adolescents, we first obtained the informed consent of the guardian of the teenagers, and then the informed consent of the adolescents themselves. Informed written consent was sought from the adolescents and their guardians. If a child had lost both parents (i.e. in the case of orphans), we obtained the informed consent from the child and his guardian.

Adolescents with HIV, from 10 to 20 (inclusive) years of age comprised the case

group. The healthy adolescents in Shangcai county who were not infected with HIV were used as the control group. Their parents were healthy and the family was complete. Inclusion criteria: age 10–20 years old; the patient meets the definition in this study of an adolescent with HIV; in the first half of the investigation, the adolescents have been living in Shangcai county. The exclusion criteria were: unconfirmed HIV infection status; the patient is too ill to participate in the study.

The research met ethical guidelines according to the Declaration of Helsinki, and approval was granted by the Ethics Committee of Harbin Medical University. The interviewers were trained education and psychology graduate students. It took about 1h to complete the entire assessment inventory, including taking breaks. The questionnaires were collected immediately when completed. We checked the questionnaires to avoid errors and ensure data quality and provided a gift as a token of appreciation for participation. All participants signed informed consent forms after receiving explanations of the research purpose, meaning, and content. All of the adolescents participated voluntarily.

Patient and public involvement

Self-concept is a cognitive assessment of one's own abilities and weaknesses. Self-concept itself is the subjective and internal evaluation of one's self. Therefore, we selected the Piers-Harris Children's Self-concept Scale to measure their self-concept, without the influence of subjective preference on the results. We have sent the results to the local CDC (Chinese Center for Disease Control and Prevention) in the form

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of email after we get the results. The CDC informs participants by phone.

Measures

Outcome measures

The Piers-Harris Children's Self-concept Scale is a paper-and-pencil test consisting of 80 items which are scored as either true or false. The items are self-descriptive declarative statements. The scores range from 1–80; higher scores indicate higher levels of self-concept. The statements are worded in both positive and negative language to control for social desirability responding. The scale has good reliability and validity and the Cronbach's alpha of the scale was 0.858 in the current study.

Stress related to interpersonal stressors was assessed by the Perceived Stress Scale. The scale consists of ten items. Each item has a score range of 0–4, with a possible total score of 40. Higher scores indicate higher levels of stress. The internal consistency measured by Cronbach's alpha in this study was 0.847.

The Perceived Social Support Scale (PSSS), developed by Zimet et al. consists of 12 items that were revised from three subscales (family, friend, and other support).

Participants responded to the items on a 7-point Likert-type scale indicating disagreement/agreement. Each item was divided into a total score for social support.

Items were adjusted to be more appropriate for children with HIV in the current study.

The items "leaders, relatives and colleagues" were changed to "teachers, relatives and students. Cronbach's alpha was 0.887 in this study. We used the Simplified Coping

Style Questionnaire (SCSQ) to measure coping style. The SCSQ includes 20 items

that contain two dimensions of coping (positive and negative). Each dimension consists of 10 items, and each item is scored on a 5-point scale, where 1 indicates 'certainly not' and 5 indicates 'certainly.' A higher score on one dimension indicates that the individual is more likely to utilize this type of coping strategy. The questionnaire is highly reliable and suitable for a Chinese population. The Cronbach's alpha for the two independent dimensions of coping were 0.70 and 0.69.

Data analysis

The Statistical Package for Social Sciences 19.0 (SPSS 19.0) program (IBM, Armonk, NY, USA) was used for statistical analysis. All tests were two-tailed and the significance level was set at a $p < 0.05$. Differences between the groups were tested using Student's t-test and ANOVA was used to test continuous variables. The relationship between environmental personality factors and adolescent self-concept was examined using Pearson correlation analyses. Hierarchical linear regression analysis was used to model the effects of environmental personality factors on self-concept in adolescents. In the regression model, gender, age, family economic status, and family structure were entered in the first block to control for potential confounding variables. In the second block, perceived stress factors were entered into the model. Third, after controlling for sociodemographic variables and perceived stress factors, perceived social support was entered into the model. Finally, after controlling for sociodemographic variables, perceived stress factors, and perceived social support, coping style was entered into the model.

Results

Study population

Adolescents were asked to report on individual and family characteristics including age, gender, family economic status (i.e., good, moderate, and poor), and family structure (intact/non-intact).

Comparison of self-concept between the case group and control group

The self-concept levels of adolescents with HIV were significantly lower than healthy adolescents ($p < 0.05$; Table 1).

Table 1. Comparison of the levels of self-concept between HIV-infected and control adolescents

	Adolescents with HIV (N = 139)	Healthy adolescents (N = 144)	t	p
Self-concept score	51.55	60.22	-9.37	0.00**

Sociodemographic data and self-concept total scores by different sociodemographic variables

Of the 139 participants, 88 were males and 51 were females. The number of participants in each age group was as follows: 8–13 years, 28; 13–16 years, 80; and 16–18 years, 31. The family economic status was as follows: good, 48; moderate, 79; and poor, 12. Fifty-seven and eighty-two adolescents with HIV did and did not have an intact family structure, respectively. No significant differences in self-concept total

scores existed between gender, age, family economic status, or family structure (Table 2).

Table 2. Participants' socio-demographic data and self-concept total scores by socio-demographic variables

	Group	N (%)	Self-concept score	F/t	p
Gender				0.08	0.78
	Male	88 (63.3)	52.08 ± 10.71		
	Female	51 (36.7)	50.65 ± 11.27		
Age				1.44	0.24
	8–13	28 (20.1)	53.43 ± 11.86		
	13–16	80 (57.6)	50.21 ± 10.67		
	16–18	31 (22.3)	53.32 ± 10.44		
Family economic status				2.74	0.07
	Good	48 (34.5)	50.46 ± 10.03		
	Moderate	79 (56.8)	51.18 ± 11.38		
	Poor	12 (8.6)	58.42 ± 10.90		
Family structure				0.18	0.67
	Intact	82 (59.0)	52.63 ± 10.46		
	Non-intact	57 (41.0)	50.00 ± 11.42		

Relationship between perceived stress, perceived social support, coping style factors, and self-concept total scores

We collected self-concept total scores for perceived stress, perceived social support,

and coping style factors in adolescents with HIV (Table 3). Statistically significant linear relationships existed among perceived stress, perceived social support, coping style factors, and the self-concept total scores of adolescents with HIV ($p < 0.05$). Among these variables, perceived stress ($r = -0.23$, $p < 0.05$) and negative coping style ($r = -0.26$, $p < 0.05$) were negatively related to the self-concept total scores. Conversely, perceived social support ($r = 0.28$, $p < 0.05$) and positive coping style ($r = 0.25$, $p < 0.05$) were positively associated with self-concept total scores.

Table 3. Correlations among perceived stress, perceived social support, coping style factors, and self-concept total scores

	Perceived stress	Perceived social support	Positive coping style	Negative coping style
Self-concept	-0.23**	0.28**	0.25**	-0.26**

Hierarchical linear regression analysis of the relationship among perceived stress, perceived social support, coping style factors, and self-concept total scores

Eight variables accounted for 37.0% of the total variance of the self-concept total scores (Table 4). The control variables accounted for 7% of the variance in the self-concept total scores (F change = 2.46), and among the control variables, age ($\beta = -0.19$, $t = -2.16$, $p = 0.03$) was significantly associated with the self-concept total scores. By including the perceived stress variable, the variance which could be explained increased to 10%. The variance in self-concept total scores (F change = 4.91) and perceived stress ($\beta = -0.19$, $t = -2.22$, $p = 0.03$) was significantly associated

with the self-concept total scores. Adding the perceived social support factor contributed to an additional 7% of the variance in the self-concept total scores (F change = 10.55), and perceived social support ($\beta = 0.26$, $t = 3.25$, $p = 0.00$) was significantly associated with the self-concept total scores. Finally, adding the positive and negative coping factors contributed to an additional 20% of the variance in the self-concept total scores (F change = 21.00). Positive ($\beta = 0.50$, $t = 5.75$, $p = 0.00$) and negative coping styles ($\beta = -0.45$, $t = -5.33$, $p = 0.00$) were significantly associated with the self-concept total scores.

Table 4. Hierarchical linear regression analysis of the relationships among perceived stress, perceived social support, coping style factors, and self-concept total scores

		β	t	p	F change	R^2	R^2 change
Step 1					2.46	0.07	0.07
	Gender	-0.08	-0.98	0.33			
	Age	-0.19	-2.16	0.03			
	Family economic status	0.10	1.10	0.27			
	Family structure	0.11	1.31	0.19			
Step 2					4.91	0.10	0.03
	Gender	-0.10	-1.17	0.24			
	Age	-0.12	-1.37	0.17			
	Family economic status	0.10	1.19	0.24			
	Family structure	0.10	1.14	0.26			
	Perceived stress	-0.19	-2.22	0.03			
Step 3					10.55	0.17	0.07
	Gender	-0.11	-1.36	0.18			
	Age	0.13	-1.55	0.12			

	Family economic status	0.06	0.73	0.47			
	Family structure	0.09	1.16	0.25			
	Perceived stress	-0.18	-2.12	0.04			
	Perceived social support	0.26	3.25	0.00			
Step 4					21.00	0.37	0.20
	Gender	-0.13	-1.76	0.08			
	Age	-0.15	-1.98	0.05			
	Family economic status	0.05	0.64	0.52			
	Family structure	0.07	0.91	0.36			
	Perceived stress	-0.17	-2.20	0.03			
	Perceived social support	0.15	2.06	0.04			
	Positive coping style	0.50	5.75	0.00			
	Negative coping style	-0.45	-5.33	0.00			

Discussion

This study was the first to explore the factors which influence self-concept among adolescents in China infected with HIV. We selected a group of adolescents with HIV, and analyzed the risk and protective factors. The purpose of this study was to determine whether perceived stress, perceived social support, and coping style are related to the self-concept of adolescents with HIV. The overall results confirmed that age, perceived stress, perceived social support, and coping style factors were associated with self-concept in adolescents with HIV. Specifically, younger age, lower perceived stress, and lower levels of negative coping styles were associated with higher levels of self-concept among adolescents with HIV. Conversely, higher perceived social support and more positive coping styles were positively correlated

326 with the self-concept of adolescents with HIV. These findings highlight the
327 significance of these factors on the self-concept of adolescents with HIV.

328 Our results showed that age significantly influenced the self-concept of adolescents
329 with HIV. Developmental psychology has shown that the children's self-concept
330 changes dramatically during adolescence and increases significantly with age[36].

331 Our findings showed that the older the adolescents with HIV, the lower the level of
332 self-concept. We concluded that for this group of adolescents, with age, some drop
333 out of school due to illness, face the fear of disease, even social pressure and
334 discrimination. Adolescents lose confidence as part of their experience of disease
335 along with increased social stress, thus older adolescents with HIV have lower
336 self-concept levels.

337 Our findings showed that perceived stress is negatively related to self-concept in
338 adolescents with HIV. This finding was similar to related previous studies, although
339 none of which examined the relationship between self-concept and perceived stress of
340 adolescents with HIV. Civitci et al.[37] and Hoffman et al.[38] report high negative
341 correlations between self-concept and perceived stress in adolescents. A study in
342 China also showed that the intensity of perceived stress was significantly correlated
343 with the level of self-concept, which was consistent with the results of our study
344 conducted in adolescents with HIV[39]. Because of the lethality of AIDS and
345 disease-related social discrimination, people with HIV are often subject to great
346 psychological stress[40 41]. Adolescents with HIV not only face the long-term
347 psychological pain of losing parents, but also continue to face a variety of external

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stressors. These factors can lead to higher perceived stress of adolescents with HIV than that experienced by healthy adolescents, thus their self-concept tends to be lower. Therefore, in the education of families and schools with adolescents with HIV, we should teach them how to best manage and deal with stress, and how to increase their level of self-concept. We should mainly encourage them to develop their resilience. The society should provide adolescents who have HIV with social support from a professional psychological perspective.

We found that perceived social support was positively related to self-concept among adolescents infected with HIV. The existing literature also suggests that adolescents infected with HIV who receive more perceived social support report higher levels of self-concept. A survey involving 21 HIV-positive patients in a southern U.S. city reported that a high level of self-concept largely depends on positive social support and interactions[42]. In a 5-year follow-up longitudinal study, Haven et al. found that the greater the perceived social support among adolescents infected with HIV, the higher the psychological adaptation and the higher the self-concept. An international study showed that social support from teachers, classmates, and parents increases the self-concept of adolescents with HIV[43]. This was consistent with the findings of our study. In some areas, HIV knowledge is not adequate, and adolescents with HIV are often subjected to discrimination and indifference from others, resulting in their fear of being rejected. As a result, adolescents with HIV lose self-confidence and their sense of self-concept suffers. Therefore, we should increase awareness of how to treat and manage AIDS patients. We should encourage adolescents with HIV to interact

with others, enhance self-confidence, and actively participate in social activities.

Correlation analyses showed that there was a significant positive correlation between self-concept, positive coping style, and problem-solving among adolescents with HIV, which was negatively correlated with negative coping style, such as escape, withdrawal, and inferiority. There are many studies that support our conclusion. Pala et al.[44] reported that individuals with active coping strategies acquire a high self-concept, whereas individuals with passive-avoidant coping styles will have low self-esteem. In a northern California adolescent sample, Mantzicopoulos et al.[45] found that high self-concept was correlated with active-positive coping styles. Adolescents with HIV are a specific group and they face many more pressures than healthy adolescents. Such pressures will necessitate facing problems, which may result in a negative coping style, such as escapism. The development of a long-term negative coping style is associated with a variety of psychological problems, which can affect an individual's self-evaluation and understanding. Therefore, the development of a positive or negative coping style for self-concept is very important. Adolescents with HIV should be encouraged to adopt positive and active coping strategies which will improve self-confidence, resilience, and self-concept.

We identified four factors which influence the self-concept of adolescents with HIV and discussed two aspects of the risk and protective factors, so that future work can develop a two-way intervention. Our findings suggest that we should provide more social support to adolescents with HIV so that they can cope with difficulties in a positive way and reduce their feelings of stress, which may lead to improvements in

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their self-concept.

Study limitations

Some limitations of this study must be acknowledged. First, the sample size of this study was small. Adolescents with HIV reside in widely dispersed areas. The survey was conducted in a county of China in Henan province where adolescents with HIV are relatively concentrated. Therefore, the findings of the survey can only represent the self-concept of adolescents infected with HIV, but does not represent the entire Henan province or even the entire country. Second, this study was a cross-sectional survey. After investigating the self-concept of adolescents with HIV, we also investigated the perceived stress, social support, and coping styles of adolescents infected with HIV. This study only explored the relationship between adolescents with HIV and self-concept, and cannot explain the deeper causal relationship among variables; further research and analysis are warranted for validation. Third, the assessment of self-concept was carried out using the scale evaluation method, and for adolescents with HIV the differences in individual language and verbal cognitive abilities may interfere with the final findings. Fourth, the adolescents we surveyed were all infected from mother-to-child transmission. This may not be representative of the self-consciousness of all adolescents with HIV.

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Contributors

YJY and SYK conceived and designed the study, supervised the analysis, and interpreted the data. XXY and XHQ supervised the analysis, interpreted the data, and wrote the preliminary manuscript. ZXQ, XJS and EYZ supervised the data collection by JWZ, WBW, and YWC. SYK performed the test administration, compiled the data, and wrote the preliminary manuscript. All authors contributed to the writing and review of the manuscript and approved the final version. We wish to thank International Science Editing for their help in editing the language of the manuscript. At the same time, we would like to thank the patient advisers for their cooperation and support in this study.

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Competing interests

The authors declare that there are no competing or potential conflicts of interest. No

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conflict of interest exists in the submission of the manuscript, and the manuscript was approved by all authors for publication. The work described is original research that has not been published previously, and is not under consideration for publication elsewhere, in whole or in part.

Ethical considerations

The research was conducted in accordance with the ethical guidelines of the Declaration of Helsinki and was approved by the Ethics Committee of Harbin Medical University. All participants provided written informed consent after being informed of the research purpose, meaning, and content. All the adolescents participated voluntarily.

Data sharing statement

No additional data are available.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4-7
Methods			
Study design	4	Present key elements of study design early in the paper	8-9
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	9
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	9
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	9
Bias	9	Describe any efforts to address potential sources of bias	8

Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	10-11
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	12
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	13
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	14
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	15-16
		(b) Report category boundaries when continuous variables were categorized	

		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	19
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	17
Generalisability	21	Discuss the generalisability (external validity) of the study results	18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	21

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.