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ORIGINAL RESEARCH

# Interest-Curiosity, Depression, and Peer Relationships Among Chinese Adolescents: A Cross-Lagged, Semi-Longitudinal Study

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**Background:** Based on cognitive-behavioral therapy and the positive emotion expansion and construction theory, this study investigated how interest-curiosity influences adolescent peer relationships through depressive symptoms.

**Methods:** A cross-lagged, semi-longitudinal study was conducted with Chinese adolescents (N = 224; $M_{age}$ = 13.23, $SD$ = 0.95). Data were collected in December 2023 (T1) and March 2024 (T2). Semi-longitudinal analyses were employed to examine the relationships among interest-curiosity, depressive symptoms, and peer relationships.

**Results:** The findings revealed that (1) adolescents with higher levels of interest-curiosity tended to experience lower levels of depressive symptoms over time; (2) adolescents who reported higher levels of depressive symptoms were more likely to experience difficulties in peer relationships; and (3) the positive influence of interest-curiosity on peer relationships was explained by its role in reducing depressive symptoms.

**Conclusion:** This study highlights the crucial role of interest-curiosity in adolescent development. The findings suggest that fostering adolescents' interest-curiosity may help reduce depressive symptoms and consequently enhance peer relationships.

**Keywords:** interest-curiosity, depression, peer relationships, adolescent, longitudinal study

## Introduction

The transition from childhood to adolescence marks a critical period of neurological and emotional development, characterized by significant changes in brain structure and function, particularly in regions associated with social cognition and emotional regulation.[1,2] During this developmental stage, adolescents experience an increasing need for autonomy while showing heightened sensitivity to social influences, especially from peers.[3] In Chinese culture, which emphasizes collectivistic values and interpersonal harmony, peer relationships carry additional significance. Adolescents build their understanding of themselves and society through peer interactions,[4] with poor peer relationships potentially leading to psychological and behavioral problems,[5] particularly in cultural contexts where group harmony is highly valued.[6] Conversely, good peer relationships often promote adolescents' health and happiness,[7] serving as a protective factor against psychological distress. Therefore, exploring how to improve adolescents' peer relationships, especially within specific cultural contexts, plays a vital role in their development.

Based on Beck's cognitive theory, individuals' cognitive schemas and information processing patterns fundamentally shape their emotional experiences and behavioral responses.[8] Interest-curiosity, as a positive cognitive orientation, represents a crucial cognitive schema that influences how adolescents process and respond to environmental information. This type of curiosity, sparked by interest, typically facilitates the generation of positive emotions while inhibiting negative emotions, ultimately affecting individuals' social connections and behaviors.[9] This cognitive mechanism is particularly significant in adolescent social development, as it potentially influences both emotional regulation (by reducing depressive symptoms) and social behavior (by enhancing peer relationships). Despite the theoretical importance of these relationships, no previous research has systematically examined the longitudinal connections between

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adolescents' interest-curiosity, depression, and peer relationships. To address this gap, our study employs a cross-lagged, semi-longitudinal design with follow-up data to investigate these temporal relationships, aiming to understand how interest-curiosity might enhance peer relationships through the reduction of depressive symptoms.

## The Impact of Interest-Curiosity on Peer Relationships

According to Litman and Spielberger,[10] curiosity is a desire for knowledge that leads to exploratory behavior. In the field of education, curiosity is viewed as a predictor of academic achievement[11,12] and is considered a missing piece for academic success.[13] However, for centuries, schools have had a reputation for reducing rather than increasing students' curiosity.[14] Kashdan et al found that curiosity is related to positive relationships,[15] and curious individuals tend to seek intimacy and establish connections.[16–18] However, teacher-student and peer relationships in school are the most important interpersonal relationships for adolescents. Although study have found that curiosity can predict teacher-student relationships.[19] However, few studies have examined the impact of curiosity on peer relationships.

Peer relationships are one of the most important relationships in the development of adolescents.[4] Individuals with higher levels of curiosity are open and accepting of others' behaviors, emotions, and experiences. This open attitude is conducive to experiencing positive emotions,[20] promoting positive social interactions, and establishing good interpersonal relationships. For example, Kashdan et al found that curiosity can reduce interpersonal aggression.[21] Some studies have explored the connection between curiosity and peer relationships. For example, Ur-Rehman and Siddiqui found a significant positive correlation between curiosity and peer influence,[22] while Han et al discovered that curiosity is positively correlated with social and emotional skills as well as happiness.[23] Social-emotional skills can frequently enhance adolescents' peer relationships.[24] The broaden-and-build theory of positive emotions[25,26] posits that positive emotions facilitate the generation of diverse thoughts and behaviors, consequently enhancing personal resources that contribute to well-being and the experience of positive emotions. When curiosity is pleasurable (ie, interest-curiosity), it can stimulate broadening and building processes by providing the desired positive impact.[27] Interest-curiosity, as a type of curiosity, can prompt individuals to try new things, explore complex ideas, and meet interesting people,[28] thereby enhancing adolescents' peer relationships. Based on this, the study proposes hypothesis 1 (H1): Interest-curiosity can positively predict peer relationships.

## The Impact of Interest-Curiosity on Depression

The incidence of depression among adolescents is a serious health problem that has been on the rise in recent years. According to statistics, the incidence of adolescent depression varies across different countries and regions, but it is a universal phenomenon. Depression can cause an individual to experience prolonged feelings of low mood, sadness, and loss of interest,[29] significantly impacting the daily life of adolescents.[30] Although researchers have explored the relationship between curiosity and depression, the causal link between depression and curiosity remains controversial. On the one hand, some studies suggest that depression can reduce curiosity. For example, Rodrigue et al found that, compared with elated participants, temporarily depressed participants reported lower curiosity, perceived value of information, and desire for additional knowledge.[31] Lydon-Staley et al found that curiosity was higher on days when happiness and physical activity levels were high, and curiosity was lower on days when mood was more depressed.[32] On the other hand, some researchers believe that curiosity can reduce depression. For example, Jamalabadi et al found that curiosity can significantly reduce individual depression and anxiety.[33] In another study, Zainal and Newman discovered that a decrease in cognitive needs predicts an increase in depressive symptoms.[34] They proposed that curiosity helps prevent the development of future depressive symptoms. However, interest-curiosity is stimulated by positive enjoyment, excitement, and the related experiences of stimulation, discovery, and understanding. This pleasant interest-curiosity can be cultivated by enabling individuals to experience positive stimulation. According to the theory of broaden-and-build of positive emotions,[25,26] this type of positive experience helps in developing individual positive emotions and reduces the escalation of negative emotions (eg, depression). Therefore, this study favors the second view and proposes hypothesis 2 (H2): Interest-curiosity can negatively predict depression.

## The Mediating Role of Depression

Peer relationships are perceived through acceptance, reliability, and close connections with friends and peers.[35] Raboteg-Saric and Sakic found that adolescents with higher friendship quality exhibited greater life satisfaction, subjective well-being, and self-esteem.[36] In contrast, difficulty in making friends was linked to more severe depressive symptoms.[37] Numerous studies have investigated the adverse effects of depression on peer relationships. For example, De Matos et al found that poorer peer relationships are related to stronger depressive symptoms.[38] Hazel et al demonstrated a negative correlation between depressive symptoms and adolescent peer relationships.[39] Adedeji et al study further confirmed that various aspects of peer relationships (peer acceptance, strong support, close friendships, and ease of forming new friendships) are significantly associated with the severity of depressive symptoms.[40] Based on this, we propose hypothesis 3 (H3): Depression can have a negative predictive effect on peer relationships.

In addition, cognitive-behavioral therapy mentions that cognition can affect the peer relationship of adolescents through emotions.[41] Interest-curiosity, as a manifestation of high cognitive needs induced by interest, may serve as an important cognitive antecedent in this process. Research has shown that lower levels of cognitive needs predict future depressive symptoms, while depression often impairs adolescents' peer relationships. The mediating role of depression in this relationship is particularly important for several reasons: First, it provides a theoretical mechanism explaining how cognitive factors (interest-curiosity) translate into social outcomes (peer relationships) through emotional pathways. Second, this mediation model integrates cognitive, emotional, and social aspects of adolescent development, offering a more comprehensive understanding of these interrelated processes. Third, the stability of this mediating effect over time suggests its potential value for long-term intervention strategies.

Specifically, Etkin et al found that cognitive-behavioral therapy could reduce anxiety and improve adolescents' social functioning and peer relationships.[42] Interest-curiosity is a manifestation of high cognitive needs induced by interest.[9] Zainal and Newman found that lower levels of cognitive needs predict higher depressive symptoms in the future,[43] while higher levels of depression are often damaging to adolescents' peer relationships.[44–46] Therefore, interest-curiosity, as a positive cognitive orientation, may enhance peer relationships through its role in reducing depressive symptoms. Combining the effects of curiosity and depression, as well as depression and peer relationships, it can be observed that depression may play a significant connecting role in the relationship between curiosity and peers. This role is relatively stable and may have enduring effects over time. Therefore, this study combines the above hypotheses and proposes Hypothesis 4 (H4): Depression plays a mediating role between interest-curiosity and peer relationships.

## This Study

This study aims to examine how interest-curiosity, as a modifiable cognitive factor, influences adolescent peer relationships through its effects on depressive symptoms (Figure 1). Although previous research has explored the link between curiosity, depression, and peer relationships, there are still unresolved issues in this field. First, most previous studies have explored the relationship between curiosity and peer relationships from the perspective of interpersonal curiosity, but few studies have focused on the impact of cognitive curiosity on peer relationships. Cognitive curiosity includes two dimensions, interest-curiosity and deprivation-curiosity. According to the theory of positive emotion expansion and construction, the positive experiences linked to interest-curiosity may promote the positive development of adolescents' peer relationships. Therefore, this study uses interest-curiosity as an independent variable to explore the impact of

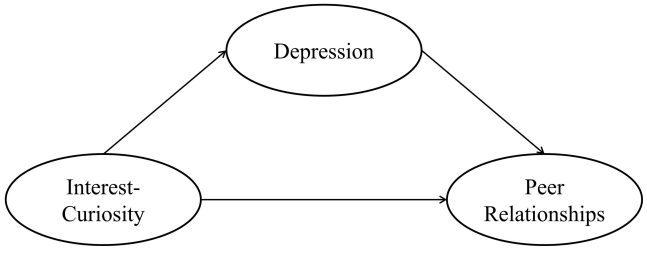


**Figure 1** Hypothesis model.


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curiosity on peer relationships. Second, the causal relationship between curiosity and depression is controversial, possibly due to the multiple dimensions of curiosity. As of now, there is no research investigating the causal relationship between interest-curiosity, and depression. Therefore, this study was carried out to investigate the causal relationship between interest-curiosity and depression. Finally, because the underlying mechanism by which interest-curiosity affects peer relationships is still unclear, this study is based on cognitive-behavioral therapy, proposes the mediating role of depression in the relationship between interest-curiosity and peer relationships.

Grounded in the theoretical framework of cognitive-behavioral therapy, particularly Beck's cognitive theory, this study focuses on adolescents as the research participants and uses a cross-lagged, semi-longitudinal design to construct a structural equation model involving the three variables of curiosity, depression, and peer relationships. Through competitive model comparison, the best model was selected to further explore the predictive relationship and longitudinal mechanism between adolescents' interest-curiosity, depression, and peer relationships. The following are the hypotheses of this study:

H1: interest-curiosity can positively predict peer relationships.

H2: interest-curiosity can negatively predict depression.

H3: depression can negatively predict peer relationships.

H4: depression plays a mediating role between interest-curiosity and peer relationships.

# Materials and Methods

## Participants and Procedure

This study selected junior high school students in Shaanxi Province as participants, with a total of two surveys. With the support of the school leaders, the research assistant informed the students about the purpose of this study on a class-by-class basis.

The first measurement (T1) was conducted at the end of December 2023. Specifically, the two weekends of December 1st to 2nd and December 9th to 10th were used. The teacher distributed electronic questionnaires to students and invited students to participate in the study. A total of 267 samples were received in the first time (mean age = 13.23 ± 0.91, age range = 12–15 age, 47.6% male), all of which were valid. Among them, 110 were in the first grade of junior high school, 103 were in the second grade, and 54 were in the third grade.

The second test (T2) will be conducted on the same group of students at the same school at the end of March 2024. Specifically, March 16th to March 16th, March 17th, and March 23rd to March 24th were used. A total of 236 samples were received in the second time (mean age = 13.61 ± 0.89, age range = 12–16 age, 46.2% male), all of which were valid. Among them, 103 were in the first grade of junior high school, 83 were in the second grade, and 50 were in the third grade.

The first time was paired with the second time one by one, and 224 samples that were valid for both measurements were finally collected (mean ageT1 = 13. 23 ± 0.95, age rangeT1 = 12–15 age, 46.9% male), resulting in an effective tracking rate of 83.9%. Among them, there are 94 students in the first grade of junior high school (46 males), 80 students in the second grade of junior high school (40 males), and 50 students in the third grade of junior high school (19 males). The data have been approved by the ethics committee of the author's institution.

## Measures

### Interest-Curiosity

The interest-curiosity subscale of the junior middle school students' cognitive curiosity scale revised by Xia et al was used for measurement.[47] This subscale consists of 6 items (eg, likes to explore new ideas) and each item was measured on a 4-point Likert scale ranging from 1 (almost never) to 4 (almost always). The higher the total average score, the stronger the level of the individual's interest-curiosity. A previous study has extensively applied this scale.[48] In this study,

the Cronbach's α coefficient of T1 interest-curiosity was 0.814, and the Cronbach's α coefficient of T2 interest-curiosity was 0.866.

### Depression

Gong et al's Chinese Revised Depression and Anxiety Scale was based on the Depression-Anxiety Stress Scale (DASS).[49,50] The Chinese version of the scale includes 21 items: anxiety (seven items), depression (seven items), and stress (seven items). The current study focused on depression subscale (7 items in total, eg, I have been experiencing negative feelings). Each item was measured on a 4-point Likert scale ranging from 1 (never) to 4 (always). Higher total scores indicate a more robust presence and higher levels of depression. In this study, the Cronbach's α coefficient of T1 depression was 0.880, and the Cronbach's α coefficient of T2 depression was 0.918.

### Peer Relationships

The peer relationship subscale of the school adjustment questionnaire for junior high school students compiled by Trina was used to measure participants' peer relationship levels.[51] Peer relationships are measured using 6 items (eg, in school, no classmates play with me). Each item was measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). All items are reverse scored. The sum of the scores of each item is the total score, and the higher the score, the better the level of peer relationships. In addition, a previous study showed that the questionnaire worked well in a sample of adolescents.[52] In this study, the Cronbach's α coefficient of T1 peer relationship was 0.903, and the Cronbach's α coefficient of T2 peer relationship was 0.915.

## Data Analysis

Referring to the research by Li et al.[53] First, SPSS 24.0 was used to conduct descriptive analysis and correlation analysis on the data from the two measurements. Second, Amos 24.0 was used to construct the cross-lagged, semi-longitudinal model and conduct path analysis. The model included autoregressive paths (T1 to T2) for both interest-curiosity, depression and peer relationships to account for stability in these constructs over time. We tested whether T1 interest-curiosity predicted T2 depression (controlling for T1 depression), and whether T2 depression, in turn, predicted T2 peer relationships (controlling for T1 peer relationships).

Specifically, referring to the method of testing cross-lagged, semi-longitudinal models proposed by Martens and Haase,[54] the testing process mainly involves evaluating multiple models and ultimately selecting the best-fitting model. The model path of this study is shown in Figure 2. Model 1 (M1), a baseline model, was an autoregressive model without cross-lag effects. This model revealed the time stability of variables. Based on the M1, Model 2 (M2) added the cross-lagged paths from T1 interest-curiosity to T2 depression and T2 peer relationships to explore the predictive effect of T1 interest-curiosity on T2 depression and T2 peer relationships. Based on the M1, Model 3 (M3) added the cross-lagged paths from T1 depression to T2 interest-curiosity and T2 peer relationships to explore the predictive effect of T1 depression on T2 interest-curiosity and T2 peer relationships. Based on the M1, Model 4 (M4) added the cross-lagged paths from T1 peer relationships to T2 depression and T2 interest-curiosity to explore the predictive effect of T1 peer relationships on T2 depression and T2 interest-curiosity. Model 5 includes all paths from M1 to M4. Finally, compare the different indicators of model fit from M1 to M5, and then determine the best model.

## Common Method Deviation Test

Since the data in this study all come from subjects' self-reports, we need to test the common method deviation of the variables used. A total of 38 items were included (including T1 interest-curiosity, T1 depression, T1 peer relationship, T2 interest-curiosity, T2 depression and T2 peer relationships), and the Harman single factor test was performed.[55] The results showed that there were 7 factors whose eigenvalues were greater than 1, and the interpretation rate of the first factor was 29.23%, which was less than 40%. Therefore, it can be considered that there is no obvious problem of common methodological bias in this study.

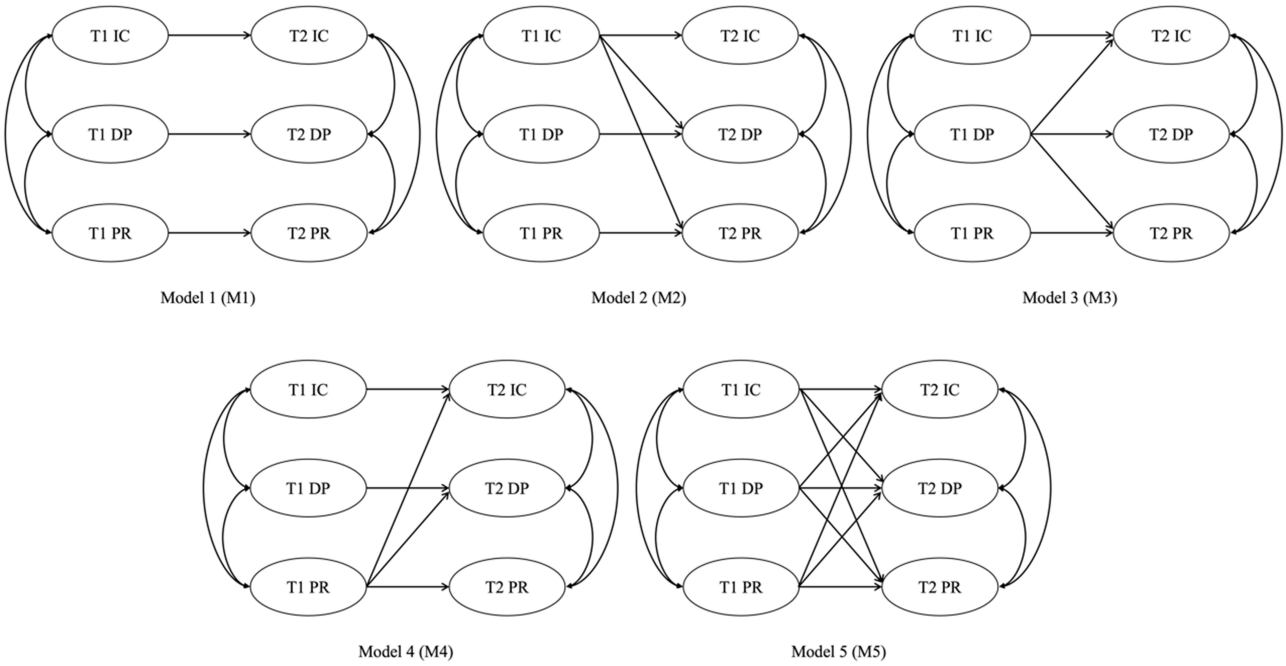


**Figure 2** The path to model 1 - model 5.

# Results

## Correlation Analysis

In Table 1, there were the descriptive statistics and correlation results of each variable. The results showed significant correlations between T1 interest-curiosity and T2 depression, and between T1 depression and T2 peer relationships.

## Cross-Lagged, Semi-Longitudinal Analysis

Amos 24.0 was used to build a model of adolescent interest-curiosity, depression, and peer relationships, in which residuals of variables at the same time point were allowed to be correlated. The fit indices of each model are shown in Table 2.

From the perspective of fitting index, the five models all fit well, among which M5 has the best fitting index. By comparing M1 with M2, M3, M4, and M5, respectively, in competitive models, the results showed that $\Delta df_{1-2} = 2$, $\Delta df_{1-3} = 2$, $\Delta df_{1-4} = 2$, $\Delta df_{1-5} = 6$; $\Delta\chi^2_{1-2} = 7.345$, $\Delta\chi^2_{1-3} = 9.973$, $\Delta\chi^2_{1-4} = 2.418$, $\Delta\chi^2_{1-5} = 15.747$; $p_{1-2}, p_{1-3}, p_{1-5} < 0.05$, $p_{1-4} > 0.05$, indicating that M1 was significantly different from M2, M3, and M5, and M2, M3, and M5 were better than M1. Further comparing the competitive models of M2, M3 and M5, the results showed that $\Delta df_{2-5} = 4$, $\Delta df_{3-5} = 4$; $\Delta\chi^2_{2-5} = 8.402$, $\Delta\chi^2_{3-5} = 5.774$; $p_{2-5}$, $p_{3-5} > 0.05$, indicating that there was no significant difference between M2, M3 and M5. Subsequently, we explored the results of M2, M3 and M5 in sequence.

**Table 1** Descriptive Statistics and Related Analysis Table

| | *M* | *SD* | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| 1. T1 IC | 14.353 | 3.506 | – | | | | |
| 2. T1 DP | 11.585 | 4.136 | 0.055 | – | | | |
| 3. T1 PR | 26.308 | 4.863 | −0.079 | −0.605*** | – | | |
| 4. T2 IC | 13.897 | 3.641 | 0.457*** | −0.175** | 0.102 | | |
| 5. T2 DP | 11.424 | 4.328 | −0.183** | 0.541*** | −0.298*** | −0.234*** | |
| 6. T2 PR | 26.005 | 4.735 | 0.068 | −0.404*** | 0.439*** | 0.101 | −0.607*** |

**Notes**: T1, time 1; T2, time 2; ***$p < 0.001$; **$p < 0.01$.
**Abbreviations**: IC, interest-curiosity; DP, depression; PR, peer relationships.

**Table 2** The Fitting Index of Model 1 ~ 5

| Model | $\chi^2$ | *df* | CFI | TLI | RMSEA | SRMR |
|---|---|---|---|---|---|---|
| Model 1 | 103.199 | 45 | 0.970 | 0.957 | 0.076 | 0.086 |
| Model 2 | 95.854 | 43 | 0.973 | 0.959 | 0.074 | 0.068 |
| Model 3 | 93.226 | 43 | 0.973 | 0.959 | 0.075 | 0.067 |
| Model 4 | 100.781 | 43 | 0.971 | 0.955 | 0.078 | 0.071 |
| Model 5 | 87.452 | 39 | 0.975 | 0.958 | 0.075 | 0.045 |

**Abbreviations**: CFI, comparative fit index; TLI, Tucker-Lewis index; RMSEA, root mean square error of approximation; SRMR, standard root mean square residuals.

**Table 3** Standardized Stability and Cross-Lag Factors

| Path | Model 2 | Model 3 | Model 5 |
|---|---|---|---|
| T1 IC —T2 IC | 0.524*** | 0.519*** | 0.541*** |
| T1 DP—T2 DP | 0.547*** | 0.594*** | 0.651*** |
| T1PR—T2 PR | 0.502*** | 0.396*** | 0.346*** |
| T1 IC—T2 DP | −0.180** | | −0.165* |
| T1 IC—T2 PR | 0.095 | | 0.070 |
| T1 DP—T2 IC | | −0.110 | −0.087 |
| T1 DP—T2 PR | | −0.172* | −0.213* |
| T1 PR—T2 IC | | | 0.036 |
| T1 PR—T2 DP | | | 0.085 |

**Notes**: T1, time 1; T2, time 2; ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.
**Abbreviations**: IC, interest-curiosity; DP, depression; PR, peer relationships.

As shown in Table 3, the results of M2 showed that the autoregression of each variable was significant, indicating that the variables were stable across time. After controlling for developmental stability and simultaneity, T1 curiosity significantly and negatively predicted T2 depression ($\beta$ = –0.180, $p$ = 0.006); T1 curiosity could not predict T2 peer relationships ($\beta$ = 0.095, $p$ = 0.152).

As shown in Table 3, the results of M3 showed that the autoregression of each variable was significant, indicating that the variables were stable across time. After controlling for developmental stability and contemporaneity, T1 depression could not predict T2 interest-curiosity ($\beta$ = –0.110, $p$ = 0.066); T1 depression significantly and negatively predicted T2 peer relationships ($\beta$ = –0.172, $p$ = 0.038).

As shown in Table 3, the results of M5 showed that the autoregression of each variable was significant, indicating that the variables were stable across time. After controlling for stability across time, T1 interest-curiosity significantly and negatively predicted T2 depression ($\beta$ = –0.165, $p$ = 0.010); T1 depression significantly and negatively predicted T2 peer relationships ($\beta$ = –0.213, $p$ = 0.021); T1 interest-curiosity could not predict T2 peer relationships ($\beta$ = 0.070, $p$ = 0.288).

## Analysis of Longitudinal Mediating Effect

According to the mediation effect analysis method of first-order longitudinal data discussed by Fang et al,[56] a cross-time analysis was conducted on the mediating role of adolescent loneliness between self-control and social anxiety. The Bootstrap method was used, the sample size was selected to be 5000, and the significance test was performed at a 95% confidence interval. The results showed that the longitudinal direct effect was not significant (estimate = 0.102 lower = −0.132, upper = 0.346, $p$ = 0.361); the longitudinal mediation effect was significant (estimate = 0.040, lower = 0.002, upper = 0.125, $p$ = 0.038), indicating that the mediation effect is a complete mediation effect.

# Discussion

Based on the integration of cognitive-behavioral therapy (CBT) and the broaden-and-build theory of positive emotions, this study employed a two-wave longitudinal design to examine the temporal relationships among adolescents' interest-curiosity, depression, and peer relationships. CBT provides a framework for understanding how cognitive patterns (interest-curiosity) influence behavior (peer relationships) through emotional mechanisms (depression), while the broaden-and-build theory explains how interest-curiosity, as a positive experience, may enhance psychological well-being by increasing positive emotions and reducing negative emotions. Our structural equation modeling revealed that adolescents' interest-curiosity indirectly influences peer relationships through depression as a complete mediator.

## Interests-Curiosity and Peer Relationships

The results indicated that adolescents' interest-curiosity could not directly predict peer relationships, contradicting hypothesis H1. This may be because, on the one hand, the interest-oriented person-object (P-O) relationship proposed by Krapp and Fink includes three aspects: the field of interest (such as music), the interest object (specific to people), and the characteristics of the interest-oriented P-O relationship (the connection between people and interests).[57] The objects of interest-curiosity are often specific events, problems, or items, while the objects of companionship are specific people. Although adolescents may focus on specific events or issues while pursuing interests and satisfying curiosity, and choose to interact with people in different fields, they are not limited to interacting only with peers who share the same interests. This diverse model of social interaction may also lead to situations where interest-curiosity does not directly impact interpersonal relationships. On the contrary, when individuals extend their curiosity from things to their peers, it can directly impact the interpersonal relationships of adolescents. For example, Han et al found that interpersonal curiosity is positively related to social and emotional skills and happiness.[23] Amorim et al revealed that social curiosity, such as an interest in learning about other people's habits, can predict teacher-student relationships.[19] On the other hand, peer relationships are based on shared experiences, mutual support, and mutual understanding. Although interest-curiosity can promote individuals to try new things, explore complex ideas, and meet interesting people,[28] peer relationships among adolescents are often not solely based on common interests or curiosity. The formation of social circles may be affected by various factors, such as personality, background, and social status. Therefore, even if two people have similar interests and hobbies, they may not be able to establish a solid companionship.

## Interests-Curiosity and Depression

The results demonstrated that adolescents' interest-curiosity negatively predicted depression, supporting hypothesis H2. This relationship can be understood through both theoretical frameworks. From the CBT perspective, interest-curiosity represents a positive cognitive schema that influences how individuals process information, leading to more adaptive interpretations of experiences and greater openness to environmental stimuli. This cognitive pattern may protect against depressive symptoms by promoting more flexible and positive information processing. From the broaden-and-build perspective, interest-curiosity, as a positive experience, helps individuals cultivate positive emotions and build psychological resources that can buffer against negative emotions like depression.

Specifically, interest-curiosity, as positive experiences, help individuals cultivate positive emotions and alleviate negative emotions (such as depression). This may be because adolescents are in a stage of self-exploration and development, and they are full of curiosity and interest in all kinds of knowledge.[58] When individuals engage in activities they enjoy, they experience a sense of well-being, which helps alleviate the stress caused by negative emotions. For example, Kaczmarek et al found that curiosity can influence depression through subjective well-being as a mediator.[59] At the same time, interest-curiosity also helps adolescents develop self-confidence and self-esteem. Through continuous exploration and learning, individuals can discover their own potential and abilities, thereby enhancing their sense of self-identity. This positive self-perception helps reduce the occurrence of depression and enables adolescents to face life more positively and optimistically.

Furthermore, the study found that depression did not predict a lack of interest-curiosity. This may be because when facing depression, adolescents may feel more negative and depressed. This negative state may temporarily inhibit curiosity, but this does not mean that individuals have lost their curiosity and desire to explore the world. On the contrary, it is this curiosity and

desire to explore that can help individuals overcome depression and rediscover the joy and motivation in life. Therefore, when dealing with depression, parents and educators can help adolescents maintain their curiosity and enthusiasm for life, guide them to find new interests and hobbies, and cultivate a positive mentality and optimistic attitude. At the same time, adolescents can alleviate depression and reignite their inner curiosity and enthusiasm by engaging in various activities, communicating with others, and seeking psychological support.

## Completely Mediation Effect of Depression

The results of the study found that depression could have a negative impact on peer relationships, thus confirming hypothesis H3. Consistent with the results of previous studies, on the one hand, adolescents in a depressed mood often feel lonely and helpless,[60] and lack trust and support from peers,[61] which leads to conflicts with peers. There is a rift in the relationship. Furthermore, some individuals may exhibit behaviors such as social avoidance and passive silence, which can lead to strained and distant peer relationships. On the other hand, depression affects adolescents' social skills and their ability to regulate their emotions, which, in turn, impacts their interactions with peers. Patients with depression may lack the ability to express positive emotions and communicate, which can lead to difficulties in establishing effective communication and interaction with peers.[62] In this case, peers may find it difficult to understand and approach the depressed person, exacerbating the estrangement and misunderstanding between them. In the long run, this negative peer relationship may increase the psychological burden of patients with depression, forming a vicious cycle.

Furthermore, our findings revealed that depression fully mediates the relationship between interest-curiosity and peer relationships, confirming hypothesis H4, which can be comprehensively understood through the integration of cognitive-behavioral therapy (CBT) and the broaden-and-build theory. From the CBT perspective, interest-curiosity functions as a positive cognitive schema that influences how adolescents process and respond to environmental information, promoting more adaptive information processing and flexible thinking that directly counteracts depressive cognitive patterns.[63] The broaden-and-build theory further explains how interest-curiosity, as a positive cognitive orientation, broadens attention and thought-action repertoires while building psychological resources, thereby reducing vulnerability to depressive symptoms.[64] This complete mediation effect suggests that interest-curiosity influences peer relationships primarily through emotional mechanisms rather than direct effects. Specifically, when adolescents have strong interests and curiosity, their high cognitive engagement motivates greater investment in exploration and learning,[15] which cultivates satisfaction, enhances self-esteem,[65] and alleviates depressive symptoms. The subsequent reduction in depressive mood facilitates positive peer cognition and the establishment of better peer relationships.[66] These findings highlight the importance of fostering adolescents' interests and curiosity through appropriate support and guidance, as this may serve as an effective pathway for promoting both emotional well-being and social development.

## Limitations and Prospects

Several limitations should be noted. First, while our two-wave design provides temporal information, it cannot fully establish causality. Future studies should employ three or more time points to better understand the developmental trajectories of these relationships. Second, our reliance on self-report measures may be subject to common method bias. Future research should incorporate multiple assessment methods, including parent, teacher, and peer evaluations. Third, other potential mediating variables, such as social anxiety or self-esteem, might also play important roles in this relationship. Future studies should consider multiple mediator models to provide a more comprehensive understanding of these mechanisms. Fourth, while we integrated CBT and the broaden-and-build theory, more research is needed to validate the application of positive emotion theories to depression symptoms. Fifth, cultural values and contexts were not fully addressed in the current study. Future research should explore how traditional Chinese cultural values (eg, collectivism, relationship orientation) moderate the relationships among interest-curiosity, depression, and peer relationships, and conduct cross-cultural comparisons to examine the cultural universality and specificity of these findings.

Drawing from cognitive-behavioral therapy and the broaden-and-build theory of positive emotions, this study investigated the complex interplay between interest-curiosity, depression, and peer relationships among adolescents through a two-wave longitudinal design. Using structural equation modeling, we uncovered two significant pathways: interest-curiosity demonstrated a unidirectional negative predictive effect on depression, and depression fully mediated the relationship between interest-curiosity and peer relationships. This mediational model suggests that interest-curiosity, as a positive

cognitive orientation, enhances peer relationships primarily through its role in reducing depressive symptoms. The integration of cognitive-behavioral principles with the broaden-and-build theory provides a comprehensive theoretical framework for understanding how interest-curiosity promotes adaptive information processing and environmental engagement, which in turn reduces depressive symptoms and facilitates positive social interactions. These findings not only advance our understanding of the developmental mechanisms linking cognitive traits to social outcomes through emotional pathways but also suggest practical implications for interventions. Specifically, programs fostering interest-curiosity may serve as an effective approach to enhancing adolescents' social-emotional development by promoting positive cognitive patterns and reducing depressive symptoms. Future research employing longer-term longitudinal designs and examining additional mediating mechanisms will further illuminate these complex developmental processes.

## Conclusions

Conclusions of this study: (1) Adolescents' T1 interest-curiosity has a significant negative predictive effect on T2 depression; (2) Adolescents' T1 depression has a significant negative predictive effect on T2 peer relationships; (3) Adolescent depression plays a complete mediating role in the relationship between interest-curiosity and peer relationships.

## Data Sharing Statement

The datasets generated during and/or analyzed during the current study are available from the first author on reasonable request.

## Ethical Information

Approval was obtained from the Ethics Committee of Xi'an Eurasia University. The procedures used in this study adhere to the tenets of the Declaration of Helsinki. All participants provided informed consent before completing the questionnaires and were paid after completing the whole questionnaires. In addition, informed consent was obtained prior to study commencement from the legal guardians of the study participants, who are minors.

## Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

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## Author Contributions

Jiali He: Formal analysis, Methodology, Writing – original draft, Writing – review & editing. Hanshu Liu: Data curation, Investigation. All authors made a significant contribution to the work reported, took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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