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Longitudinal impact of machiavellianism on adolescent prosocial behavior and suicidal risk: the role of hope and loneliness

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Abstract

Background Adolescence represents a pivotal stage marked by substantial physiological and psychological transformations, during which prosocial behavior and suicide risk are of paramount concern. Machiavellianism, a personality trait encompassing self-centeredness, utilitarianism, and manipulateness, may exert an influence on these behaviors. This study was designed to explore the impact of Machiavellianism on adolescent prosocial behavior and suicide risk, with a specific emphasis on the mediating effects of hope and loneliness.

Methods A sample of 618 Chinese middle school students (mean age: 13.65 years) participated in this study by completing assessments of Machiavellianism, hope, loneliness, prosocial behavior, and suicide risk at two distinct time points. Structural equation modeling techniques were utilized to investigate the mediating roles of hope and loneliness.

Results The findings revealed a negative correlation between Machiavellianism and prosocial behavior, as well as hope, while a positive association was observed between Machiavellianism and loneliness and suicide risk. Furthermore, hope and loneliness emerged as mediators in the relationship between Machiavellianism and both prosocial behavior and suicide risk, with hope functioning as a protective factor and loneliness serving as a risk factor.

Conclusion The study offers valuable insights into the intricate interplay among Machiavellianism, hope, loneliness, prosocial behavior, and suicide risk in adolescents. Understanding these intricate relationships can guide the development of targeted mental health interventions aimed at addressing the needs of high-risk youth.

Keywords Machiavellianism, Prosocial behavior, Suicide risk, Hope, Loneliness, Adolescence

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Introduction

Adolescence represents a pivotal period of transition from childhood to adulthood, during which individuals confront significant physiological and psychological changes and endure considerable pressure from academics and interpersonal relationships, readily predisposing them to various psychological and behavioral issues [1]. During this stage, adolescents' prosocial behavior and suicide risk are particularly noteworthy concerns [2]. Prosocial behavior refers to conscious actions benefiting others in social interactions, constituting a crucial aspect of adolescent socialization [3]. Meanwhile, suicide risk is a vital predictor of suicidal behavior, potentially leading to severe mental health problems and life-threatening situations [4].

Machiavellianism, as a significant personality trait, exerts profound influences on individuals' social behavior and psychological states [5, 6]. The concept of Machiavellianism originates from the Italian politician and historian Niccolò Machiavelli, who emphasized pragmatism in power and realpolitik [7]. In psychology, Machiavellianism is typically defined as a self-centered, utilitarian, and manipulative personality trait [8]. Individuals with Machiavellian tendencies tend to prioritize their self-interests, adept at employing strategies and tactics to achieve their goals. Machiavellians generally perceive humanity as inherently evil, believing that people often resort to any means necessary in pursuit of their self-interests, thereby adopting a negative attitude towards interpersonal relationships [8]. Furthermore, Machiavellianism views morality as relative, with the correctness of actions contingent on their contribution to goal attainment [8]. This pragmatist perspective may deprive adolescents of clear values when confronting moral dilemmas, leading them into confusion and perplexity. Therefore, investigating the impact of Machiavellianism on adolescents' prosocial behavior and suicide risk aids in gaining deeper insights into their psychological development mechanisms, providing a scientific basis for preventing and intervening in adolescent psychological issues.

Machiavellianism and prosocial behavior

Prosocial behavior refers to conscious actions that benefit others in social interactions, encompassing helping, sharing, cooperation, and more [9]. Research indicates that prosocial behavior positively impacts adolescents' mental health and social adaptation [3]. However, there are notable differences between the behavioral patterns of Machiavellians and prosocial behavior [7]. Machiavellians generally perceive humanity as inherently evil and hold a negative attitude towards interpersonal relationships, which may lead them to lack empathy and willingness to help others in need [10]. Studies have shown that

Machiavellian traits significantly negatively predict prosocial behavior [11, 12]. Individuals with high Machiavellian tendencies often believe that adhering to ethics and morals is unnecessary, and therefore refrain from helping others even when the cost is minimal [7]. This attitude and behavioral pattern may result in adolescents lacking a cooperative spirit and empathy in interpersonal interactions, thereby affecting their social adaptation and mental health. However, some studies also suggest that Machiavellians may exhibit warmth and reciprocity in their interactions with friends and colleagues [13, 14]. This complexity makes the impact of Machiavellianism on prosocial behavior more intricate and diverse. Therefore, it is necessary to explore the specific mechanisms of Machiavellianism's influence on adolescents' prosocial behavior.

Machiavellianism and suicide risk

While the link between Machiavellianism and prosocial behavior highlights its social consequences, its association with suicide risk underscores profound implications for mental health. Both outcomes may stem from shared mechanisms rooted in interpersonal alienation. Machiavellians typically hold a negative attitude towards interpersonal relationships and tend to adopt strategic means to achieve their goals. This trait may lead them to lack social support and emotional sustenance when facing difficulties and setbacks, or even perceive discrimination from others, thereby increasing their suicide risk [15–18]. Furthermore, Machiavellians may be more inclined to adopt a self-centered way of thinking, lacking empathy and understanding for others, which may also make them more prone to feelings of despair and helplessness when facing difficulties, further increasing their suicide risk [18]. Studies have also shown that Machiavellians may have fewer self-control resources and are more likely to exhibit uncontrolled emotions and even aggressive behavior under frequent stressors of life events, leading to an increase in suicide risk [19, 20]. In collectivist societies like China, where social cohesion is prioritized, adolescents with Machiavellian traits may face heightened stigmatization. Their manipulative tendencies could violate norms of reciprocity and harmony, exacerbating loneliness and reducing access to social buffers against suicide risk. This cultural context amplifies the urgency of understanding hope and loneliness as mediators.

However, some research has found that Machiavellianism does not necessarily increase suicide risk [21]. Even studies have indicated that negative emotions such as guilt are crucial factors contributing to suicide risk, while individuals with high Machiavellian tendencies experience fewer negative emotions such as guilt and less rumination over their problems, potentially leading to a lower suicide risk [22–24]. Therefore, the impact of

Machiavellianism on adolescents' suicide risk remains inconclusive, necessitating a thorough exploration of the specific mechanisms through which Machiavellianism affects adolescents' suicide risk.

The mediating role of hope and loneliness

Snyder's Hope Theory posits that hope comprises agency (goal-directed determination) and pathways (planning to meet goals), which are essential psychological resources for adolescents to navigate challenges [25]. Hope represents a process of striving to attain objectives, and such positive anticipation of the future brings numerous psychological benefits [26]. However, the negative traits of Machiavellianism, such as distrust in interpersonal relationships and disregard for others' interests, may undermine these resources, leading to a lack of positive expectations and motivation for the future, thereby affecting prosocial behavior and mental health [5, 6].

Adolescents with higher levels of hope are more likely to engage in prosocial behaviors because they believe their actions can yield positive outcomes and are willing to strive to improve others' lives [25]. Hope can serve as a protective factor that reduces suicide risk. Adolescents with high levels of hope are better able to cope with life's pressures and difficulties, see possibilities in the future, and thereby reduce suicidal ideation [27]. Conversely, high Machiavellians often have a pessimistic outlook on the future, lacking positive expectations and motivation, which may lead them to engage less in prosocial behaviors while increasing their suicide risk [18]. Therefore, Machiavellianism is negatively correlated with hope, while hope is positively correlated with prosocial behavior and negatively correlated with suicide risk, suggesting that hope mediates the impact of Machiavellianism on prosocial behavior and suicide risk [22, 28–30].

Loneliness is a maladaptive psychological state that makes adolescents feel isolated and alienated from others [31]. Adolescents with higher levels of loneliness may be more focused on their inner worlds, pay less attention to the needs of others, lack social support, and be prone to adverse interpersonal relationships such as bullying, thereby reducing prosocial behavior [32–34]. Loneliness is a significant risk factor for suicide risk. Chronic loneliness can lead adolescents to develop negative emotions such as depression and anxiety, reduce their psychological resilience, and increase their suicide risk [4, 35]. High Machiavellians' distrust and exploitative attitudes towards others may make it difficult for them to establish good interpersonal relationships, leading to feelings of loneliness and isolation; these feelings of loneliness further affect their prosocial behaviors and suicide risk [36]. Therefore, Machiavellianism is positively correlated with loneliness, loneliness is negatively correlated with prosocial behavior and positively correlated with suicide

risk, suggesting that loneliness mediates the impact of Machiavellianism on prosocial behavior and suicide risk [37, 38].

Furthermore, the goal-directedness and pathway thinking of hope can help individuals set positive goals and find ways to achieve them [25]. When individuals have clear goals and believe they can achieve them, they become more engaged in social activities and actively seek to establish connections with others, thereby reducing loneliness [39]. Additionally, hope can stimulate positive emotions such as optimism, self-confidence, and well-being in individuals. These positive emotions can improve individuals' psychological states, enhance their willingness and ability to socialize, and also contribute to reducing loneliness [40]. Therefore, hope and loneliness may play a crucial chained mediating role in the impact of Machiavellianism on adolescents' prosocial behaviors and suicide risk.

To date, no study has simultaneously examined how Machiavellianism shapes both prosocial behavior and suicide risk through hope and loneliness, particularly in collectivist cultures where interpersonal harmony is highly valued. This dual-focus approach not only addresses a critical gap in understanding Machiavellianism's paradoxical effects but also offers culturally nuanced insights for intervention design.

The present study

Currently, there is relatively little research on the impact of Machiavellianism on suicide risk among adolescents. This study aims to explore the impact of Machiavellianism on adolescents' prosocial behaviors and suicide risk and analyze the mediating roles of hope and loneliness. Firstly, by considering both prosocial behavior and suicide risk, this study comprehensively assesses adolescents' psychological states and behavioral manifestations from both positive and negative perspectives. This helps to gain a more comprehensive understanding of adolescents' psychological and behavioral characteristics and the complex relationships among them, and provides a scientific basis for formulating comprehensive intervention measures. Furthermore, this study's exploration of hope and loneliness as mediating mechanisms not only enriches research on the relationship between Machiavellianism and adolescent mental health but also deepens our understanding of the roles played by hope and loneliness in adolescent psychological development. Finally, the findings of this study have important implications for formulating intervention measures for adolescent mental health. By understanding the impact of Machiavellian traits on adolescents' hope and loneliness, and how these emotional states further affect prosocial behaviors and suicide risk, we can more accurately identify high-risk adolescent groups and provide theoretical and practical

guidance for preventing adolescent suicide and promoting prosocial behavior.

Methods

Participants and procedures

The participants in this study consisted of 618 middle school students from China, including 356 females (57.6% of the total), aged between 12 and 17 years, with a mean age of 13.65 years. Data collection was conducted through questionnaires. At Time 1 (T1), the participants completed the Kiddie Machiavellianism Scale and the Hope Scale. Six months later, at Time 2 (T2), they completed the University of California at Los Angeles Loneliness Scale, the Prosocial Behaviors Questionnaire, and the Youth Risk Behavior Survey Questionnaire. There was no attrition among the participants. All participants provided informed consent for the study, and their guardians also signed informed consent forms prior to the research. This study was reviewed and approved by the China University of Petroleum and was compliant with the Declaration of Helsinki.

Measures

Machiavellianism

To evaluate Machiavellian tendencies, we administered the Chinese-translated Kiddie Machiavellianism Scale (KMS) [41, 42]. It includes three dimensions: lack of faith in human nature, dishonesty and distrust, consisting of 20 statements such as “Sometimes you have to hurt people to get what you want.” Responses were recorded on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Prior research among Chinese participants has demonstrated the KMS’s solid internal reliability [43], which was further confirmed in our study with a Cronbach’s α of 0.71.

Hope

We employed the Hope Scale devised by Snyder et al. [44] to gauge participants’ current hope levels. This instrument encompasses six items rated on an 8-point scale spanning from 1 (completely disagree) to 8 (completely agree), structured into two facets: agency thinking and pathways thinking. Our study found the scale to exhibit high internal consistency, with a Cronbach’s α coefficient of 0.93.

Loneliness

The measurement of loneliness was based on the adolescent loneliness questionnaire revised by Zou [45]. The questionnaire consisted of 21 questions, which were divided into four dimensions: pure loneliness, perception of social ability, peer status evaluation and unsatisfied social need. Using a five-point scale from 1 (very consistent) to 5 (very inconsistent), the higher the score, the

more lonely the participant felt. In this study, the Cronbach’s α coefficient of this scale was 0.88.

Prosocial behavior

To measure prosocial behaviors, we utilized the Prosocial Behaviors Questionnaire [9], which includes four dimensions: altruism (4 items), commonweal-rule (5 items), interpersonal relationship (3 items), and personality trait (3 items). Examples of items include “I help my classmates make up lessons or play basketball” and “I keep my mouth shut about others’ secrets.” All 15 items were rated on a 7-point scale, where 1 equals complete disagreement and 7 equals complete agreement. The questionnaire demonstrated exceptional reliability in our study, with a Cronbach’s alpha coefficient of 0.96.

Suicide risk

We assessed suicide risk by the modified version of the Youth Risk Behavior Survey Questionnaire [46]. This questionnaire consists of 19 items, and we adopted one subscale incorporating three items to measure suicide risk, ranging from 1 (not at all) to 3 (always). The three items measured the frequency of suicidal ideation, suicide plans, and suicide attempts in the past six months. This questionnaire has been validated and used in previous studies involving adolescents, showing adequate psychometric properties [23]. Our study found the subscale to have good reliability, with Cronbach’s α values of 0.84.

Data analysis

Data was analyzed using SPSS Version 26.0 and AMOS Version 24.0. Descriptive statistics were computed to examine the means, standard deviations, and correlations between the variables. Structural equation modeling (SEM) was employed to examine the mediating role of hope and loneliness in the relationship between Machiavellianism and adolescent prosocial behaviors /suicide risk. We used the comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and 95% confidence interval (CI) for the model fit. When the CFI and TLI are greater than or equal to 0.90, and the RMSEA is less than or equal to 0.08, the overall model fits well [47]. To assess the significance of indirect effects, we employed the Bootstrap method with 5,000 resamples to calculate effect sizes and 95% confidence intervals (CIs) for the mediation effects.

To assess common method bias, Harman’s single-factor test was conducted. The results indicated that the variance explained by the single factor was less than 40%, suggesting that common method bias was not a significant issue in this study [48].

Table 1 Bivariate correlations and descriptive statistics among study variables ($N=365$)

Variables	M	SD	1	2	3	4	5
1. T1 Machiavellianism	22.59	6.76	-				
2. T1 Hope	30.19	8.07	-0.31***	-			
3. T2 Loneliness	40.63	15.21	0.29***	-0.24***	-		
4. T2 Prosocial Behaviors	72.80	17.20	-0.21***	0.31***	-0.44***	-	
5. T2 Suicide risk	0.58	1.26	0.17***	-0.18***	0.27***	-0.16***	-

Note. *** $p < .001$

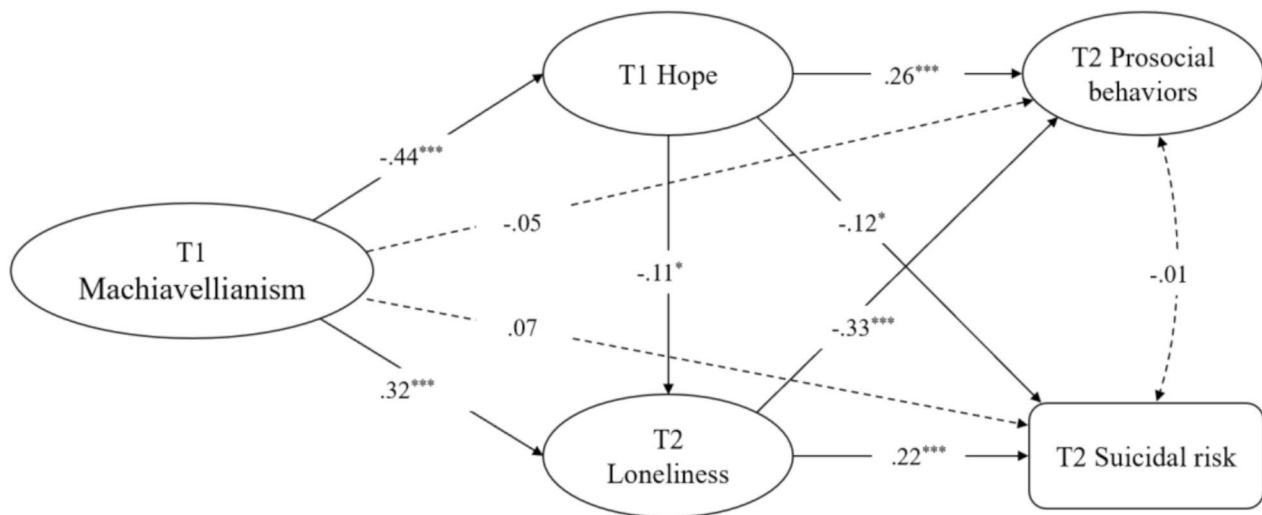


Fig. 1 A multiple mediation model of the association between machiavellianism and prosocial behavior/ suicide risk through hope and loneliness. Note. * $p < .05$, *** $p < .001$

Results

Descriptive statistics and correlations

Table 1 presents the descriptive statistics of each variable in the study and the correlation between every two variables. The present study revealed significant correlations among variables. Specifically, Machiavellianism was negatively correlated with hope and prosocial behavior, while positively correlated with loneliness and suicide risk. Hope was negatively correlated with loneliness and suicide risk, but positively correlated with prosocial behavior. Loneliness was negatively associated with prosocial behavior and positively linked to suicide risk. Furthermore, prosocial behavior exhibited a significant negative correlation with suicide risk.

Structural equation model analysis

In this study, a structural equation model was constructed, with Machiavellianism serving as the independent variable, hope and loneliness as mediator variables, and prosocial behavior and suicide risk as dependent variables. The model includes four latent variables: Machiavellianism (includes three observed variables: lack of faith in human nature, dishonesty and distrust), Hope (includes three two variables: agency thinking and pathways thinking), Loneliness (includes four observed

variables: pure loneliness, perception of social ability, peer status evaluation and unsatisfied social need), and Prosocial behavior (includes four observed variables: altruism, commonweal-rule, interpersonal relationship, and personality trait).

The model demonstrated good fit indices: $\chi^2/df = 2.993$, CFI = 0.969, TLI = 0.952, and RMSEA [90%CI] = 0.057 [0.048, 0.066]. These values meet the commonly recommended criteria for acceptable model fit (CFI > 0.90, RMSEA < 0.08).

Analysis of the pathways within the model indicated that Machiavellianism negatively predicted hope ($\beta = -0.44$, $p < .001$) and positively predicted loneliness ($\beta = 0.32$, $p < .001$). Hope positively predicted prosocial behavior ($\beta = 0.26$, $p < .001$) and negatively predicted loneliness and suicide risk ($\beta = -0.11$, $p < .05$; $\beta = -0.12$, $p < .05$, respectively). In contrast, loneliness negatively predicted prosocial behavior ($\beta = -0.33$, $p < .001$) and positively predicted suicide risk ($\beta = 0.22$, $p < .001$).

The Bootstrap results indicated that the indirect effect of Machiavellianism on prosocial behavior through hope was significant (effect size = -0.11, 95% CI [-0.18, -0.05]). Similarly, the indirect effect through loneliness was significant (effect size = 0.10, 95% CI [0.04, 0.17]). For suicide risk, the indirect effect through hope was significant

(effect size = 0.06, 95% CI [0.01, 0.12]), as was the effect through loneliness (effect size = 0.08, 95% CI [0.03, 0.14]). The serial mediation effect of hope and loneliness was also tested. Results showed that the indirect effect of Machiavellianism on prosocial behavior through the chain of hope and loneliness was significant (effect size = -0.04, 95% CI [-0.08, -0.01]). Similarly, the indirect effect on suicide risk was significant (effect size = 0.03, 95% CI [0.01, 0.06]).

Discussion

The present study delves into the impact of Machiavellianism on adolescent suicide risk and prosocial behavior, with a particular focus on the mediating roles of hope and loneliness in this intricate relationship. The findings reveal that Machiavellianism exerts significant influences on adolescents' mental health and behavioral outcomes through multiple pathways.

The study found that Machiavellian significantly negatively predict prosocial behavior among adolescents. This result aligns with prior research suggesting that Machiavellians tend to hold pessimistic views of humanity, exhibit negative attitudes towards interpersonal relationships, and lack empathy and willingness to help others [11, 12]. In this study, adolescents with higher Machiavellian were more likely to ignore or avoid individuals needing assistance, a mindset and behavioral pattern that hinders the development of good social adaptability and interpersonal relationships.

Contrary to Lester and Dadfar's findings [21], which reported no direct link between Machiavellianism and suicide risk, our results suggest a positive association. This discrepancy may stem from cultural differences: in collectivist China, Machiavellian individuals' manipulative tendencies likely violate norms of reciprocity, exacerbating social alienation and loneliness—a key driver of suicide risk. In contrast, individualistic cultures may tolerate strategic self-interest more readily, buffering its psychological consequences. The Machiavellian prediction of suicide may also be attributed to the negative attitudes of Machiavellians towards interpersonal relationships, which make it difficult for them to obtain effective social support and emotional sustenance during times of distress. Their self-centered way of thinking further increases their vulnerability to feelings of hopelessness and helplessness, thereby elevating suicide risk [18–20]. Additionally, their relatively scarce self-control resources and propensity for uncontrolled behavior under pressure may also contribute to suicide risk. In China's collectivist context, where interpersonal harmony is paramount, these mechanisms may be particularly salient, as Machiavellian adolescents' relational strategies likely clash with cultural expectations, intensifying their social alienation. In fact, in the context of China, a collectivist culture that

emphasizes interpersonal harmony and social cohesion, Machiavellian traits may be particularly stigmatizing. Adolescents with high Machiavellian tendencies are likely to violate cultural norms of reciprocity and cooperation, leading to heightened social alienation and loneliness. This cultural context amplifies the negative impact of Machiavellianism on mental health, as loneliness becomes a significant risk factor for suicide risk. In contrast, in individualistic cultures where strategic self-interest is more tolerated, the psychological consequences of Machiavellianism may be less pronounced.

Furthermore, this study confirms the mediating role of hope in the impact of Machiavellianism on adolescent prosocial behavior and suicide risk. Specifically, Machiavellianism negatively predicts hope, which in turn decreases prosocial behavior and increases suicide risk among adolescents. Adolescents with high Machiavellian often have pessimistic outlooks on the future, lacking positive expectations and motivation. This negative psychological state limits their engagement in prosocial behavior and increases their vulnerability to suicide risk [18]. Therefore, hope, as a crucial psychological resource, plays a vital role in maintaining adolescents' mental health and promoting prosocial behavior. Drawing from positive psychology, hope acts as a protective factor by fostering resilience through goal-oriented thinking [25]. In adolescents high in Machiavellianism, hope may counteract maladaptive strategies by redirecting focus toward constructive goals, thereby reducing loneliness and suicide risk. Interventions targeting hope-building (e.g., goal-setting workshops) could thus disrupt the harmful pathways identified in this study. To foster hope among adolescents, educators can implement goal-setting workshops that encourage students to identify meaningful objectives and develop pathways to achieve them. These workshops can be integrated into school curricula to promote a sense of agency and positive future orientation. Additionally, social skills training and team-building activities can help reduce loneliness by enhancing interpersonal connections and social support. For example, group projects and extracurricular activities that emphasize collaboration and mutual support can create opportunities for adolescents to build meaningful relationships, thereby mitigating the negative effects of Machiavellianism.

In addition to hope, the present study found that Machiavellian traits positively predict loneliness among adolescents, subsequently decreasing prosocial behavior and increasing suicide risk. Adolescents with high Machiavellian traits may struggle to establish good interpersonal relationships due to their distrust and exploitative attitudes towards others, leading to feelings of loneliness and isolation [36]. This loneliness not only further weakens their prosocial tendencies but also elevates

their suicide risk [4, 35]. Therefore, loneliness, as a maladaptive psychological state, plays a significant role in the impact of Machiavellianism on adolescent mental health.

The study also uncovered a serial mediation effect of hope and loneliness in the relationship between Machiavellianism and adolescent prosocial behavior and suicide risk. Specifically, Machiavellianism reduces hope, which in turn increases loneliness, ultimately affecting prosocial behavior and suicide risk. This chained mechanism underscores the importance of addressing both hope and loneliness in intervention strategies. This finding reveals the complex interplay between hope and loneliness in the impact of Machiavellianism on adolescent mental health, providing a new perspective for deepening our understanding of the mechanisms underlying adolescent psychological development.

Research implications and future directions

The findings of this study have important implications for the development of intervention measures for adolescent mental health. By understanding the influence of Machiavellianism on adolescents' hope and loneliness, as well as how these emotional states further affect prosocial behavior and suicide risk, we can more accurately identify high-risk adolescent groups and provide targeted mental health interventions for them. Interventions should be culturally tailored to address the unique challenges faced by adolescents in collectivist societies. For instance, fostering prosocial behavior and reducing loneliness may require emphasizing communal values and social harmony, which align with cultural expectations in China.

The ideological and political education of adolescents plays a pivotal role in cultivating their correct outlook on life, values, and moral concepts. Firstly, strengthening life and mental health education is particularly important given the positive correlation between Machiavellianism and the risk of suicide. Educators should use courses and activities to help adolescents understand the value of life and develop resilience and coping strategies in the face of difficulties and challenges. Secondly, cultivating a sense of hope among adolescents is crucial, as the research indicates that hope mediates the relationship between Machiavellianism and both prosocial behavior and suicidal risk, acting as a protective factor. In educational practices, emphasis should be placed on fostering a sense of hope in adolescents, using positive reinforcement and goal-setting to help them develop a positive outlook on the future, thereby enhancing their prosocial behavior and reducing the risk of suicide. Additionally, reducing the loneliness felt by adolescents is also vital, as the study found that loneliness mediates the relationship between Machiavellianism and suicidal risk, serving as a risk factor. Educators and parents should pay attention to the

social needs of adolescents and employ strategies such as team activities and social skills training to alleviate their feelings of loneliness, thereby reducing the risk of suicide.

Future research can further explore the relationship between Machiavellianism and other psychological variables, as well as the mechanisms through which these variables influence the mental health development of adolescents, providing a scientific basis for constructing a more comprehensive intervention system for adolescent mental health. Additionally, the sample in this study was limited to middle school students in China, which may restrict the generalizability of the results. Future research could expand the sample to compare results across different cultural contexts, providing a more comprehensive understanding of the impact of Machiavellianism on adolescents' mental health. Our findings should be interpreted within the collectivist Chinese context, where interpersonal harmony is highly valued. Machiavellian traits may be more stigmatized here, amplifying loneliness. Future research should also pay attention to the differences in the impact of Machiavellianism on adolescent mental health across different cultural backgrounds, offering new perspectives and ideas for cross-cultural comparative studies.

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Author contributions

KG conceived and designed the research, and wrote the first draft of the manuscript. FF was responsible for supervising the analysis and interpretation of data gathered, revising it critically. All authors reviewed the manuscript.

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Data availability

Due to privacy protection, the data and materials are not publicly available but can be provided upon reasonable request to qualified researchers.

Declarations

Ethics approval and consent to participate

All participants provided informed consent prior to study enrollment. For minors under the age of 16, both the participants and their legal guardians (parents) provided written informed consent. The research protocol was reviewed and approved by the Ethics Committee of China University of Petroleum, and the study was conducted in strict adherence to the ethical principles outlined in the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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