

More Similar to My Father, Better Academic Performance I Will Have: The Role of Caring Parenting Style

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Background: Parent-child facial resemblance, as an important cue of paternal uncertainty, may impact fathers' parenting behaviors and further affect children's academic performance. However, mothers are almost 100% confident of the blood relationship with their child and care less about the facial resemblance cues.

Methods: To test these hypotheses, the present study recruited 122 junior high school students and measured the perceived facial resemblance with their parents, the parents' parenting style, academic performance, and demographic variables.

Results: The results showed that the perceived father-child facial resemblance rather than the mother-child facial resemblance significantly influenced adolescents' academic performance. Further, fathers' caring parenting style mediated the relationship between the perceived father-child facial resemblance and academic performance.

Conclusion: These findings not only supported the paternal uncertainty hypothesis but also extended the parental investment theory.

Keywords: perceived father-child facial resemblance, academic performance, caring parenting, paternal uncertainty

Introduction

Due to the internal fertilization, women could be almost 100% sure that they had a genetic relationship with their offspring. In early human society, adultery practices were not uncommon and wives may secretly commit adultery with other men during the marriage,¹ thus, men face the risk that putative children may not be their biological children, namely paternal uncertainty.²

In the process of human evolution, men have developed a series of adaptation mechanisms to identify the certainty of paternity.³ In daily life, men unconsciously seek cues that characterize their genetic identity to assess their paternal certainty. These cues include facial resemblance,⁴⁻⁶ body odor resemblance⁴ and perceived sexual loyalty of spouse.⁷⁻⁹ Among these cues, the facial resemblance between parents and children is the most accessible direct cue.^{5,7} Studies have shown that facial resemblance between two blood-related individuals is significantly higher than that of two unrelated individuals.^{6,10,11} Therefore, researchers often adopt father-child facial resemblance as one of the indicators to measure the paternity.^{4,5,7,12,13}

According to the theory of inclusive fitness, nature was prone to select the characteristics that could promote the success in passing on genes, no matter whether the

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organism was direct descendant or genetic relative.¹⁴ Moreover, Trivers proposed that parents would invest resources to help offspring develop better, and to facilitate the spreading of their own genes.² In fact, parents would invest more resources in parenting if the offspring provide a higher reproductive value, suggesting a higher possibility of successful gene transfer.^{15–17} If males invest his limited resources on the descendants of other males, it will impair their own inclusive fitness.^{2,14} Thus, in order to ensure their own inclusive fitness, men would adjust their investments and parenting behaviors during parenthood on the basis of the paternity certainty cues,^{11,17–19} including the father-child facial resemblance.^{5–7,20,21}

Several empirical studies have demonstrated that when the father-child facial resemblance was high, fathers would adopt the positive parenting style and invest more on their children for the interest of the reproductive success rate.^{5,7,22} However, when the father-child facial resemblance was low, fathers would invest less on the development of their children because they did not want to waste their resources for children who may not pass on their genes.^{23,24} As Yu et al have found father-child facial resemblance affected the caring (supportive/engaged) parenting but not the control (hostile/coercive) parenting,²⁴ for the latter parenting could not increase the rate of reproductive success.²³

The amount of material and psychological resources that fathers invest in their offspring, which can be affected by the cues signaling paternal certainty, are vital to offspring's survival and growth.^{4,5,25} Studies have shown that father's parenting behaviors, for instance, warmth, communication, emotional support and proper autonomy, can have a positive impact on the child development.^{26–29} For example, Turner et al found that children with more autonomy and parental care had better academic performance.³⁰ In fact, paternal care and emotional warmth could encourage children to correct mistakes, develop abilities and build confidence.³¹ As a result, children having paternal care and emotional support may end up having a positive self-concept, higher

sense of responsibility,³² and better emotional skills to explore themselves in the society.³³ These consequences in turn contribute to the children's enhanced academic performance. Previous studies also have found that children, whose parents adopt positive parenting style, are relatively more successful in achieving goal orientation and showing higher social responsibility and cooperation,²⁶ which could predict children's academic performance.³⁴

Rested upon the above literature, the current study presumes that the perceived father-child facial resemblance may affect the father's caring parenting, rather than father's control parenting, which further promote the children's academic performance. Meanwhile, since mothers can be almost 100% sure of the blood relationship with the offspring, they would not be affected by the perceived mother-child facial resemblance. In sum, this study hypothesizes that the caring factor in the parenting style mediates the relationship between the perceived parent-child facial resemblance and the child's academic performance, and the parents' sex moderates this mediation model (see the model in Figure 1).

There are three paradigms to explore the facial resemblance: manipulation method using the Morph software synthesis,^{35–38} third-party rating^{10,39} and self-rating.^{5,24,40} Among these three paradigms, the internal validity is highest for the manipulation method, and the ecological validity is highest for the self-rating method.⁴⁰ To obtain the highest ecological validity, this study adopted the self-rating method to evaluate the parent-child facial resemblance. However, previous studies showed that some biases might confound the effects of the parent-child facial resemblance when it was measured by parents' self-report.^{5,40} On the one hand, fathers tend to be affected by self-serving bias, with the desirable belief that children look more like themselves.²⁴ On the other hand, to assist their offspring obtaining more resources from the fathers, mothers are prone to admit that children look like their fathers, especially when fathers are present.^{5,19,41} To preclude these biases, this study used junior high school

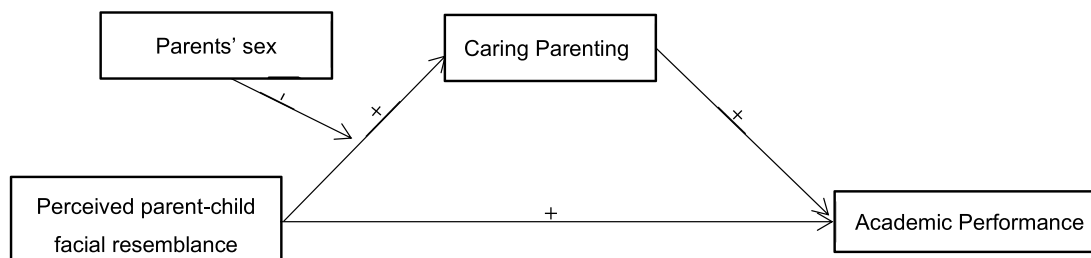


Figure 1 The influence mechanism of perceived parent-child facial resemblance on academic performance.

students as the participants to explore the mediation of the parenting style and the moderation of the parent sex among the relationship between the perceived parent-child facial resemblance and the child's academic performance. Besides, previous studies have demonstrated that academic achievement could be affected by child's sex,⁴² child's age,⁴³ parents' education⁴⁴ and family economic status.^{42,45} To eliminate the confounding effects of these, this study included these variables as control variables.

Method

Participants

A total of 137 students were recruited as participants from a high school in Fuyang City, Anhui Province, China. After removing the data of 15 participants who came from non-intact families, 122 students remained in this study. Among them, 59 were boys, 62 were girls, and one participant's sex information was missing. The mean age was 14.14 years old ($SD = 4.96$).

Measures

Perceived Parent-Child Facial Resemblance Measure

Perceived parent-child facial resemblance was measured by Yu et al Perceived Parent-Children Facial Resemblance Scale.¹³ There were four items in this scale: "In your opinion, how much do you look like your father?", "In your opinion, how much do you look like your mother?", "In your friends' or family members' views, how much do you look like your father?" and "In your friends' or family members' views, how much do you look like your mother?". The scale was rated on a 10-point Likert scale, ranging from 1 (not at all) to 10 (completely). The correlation between the two items that assessed the perceived father-child facial resemblance was 0.81, and the correlation between the two items that measured the perceived mother child facial resemblance was 0.87.

Parenting Style Measure

The shortened EMBU was adopted to measure parenting style, which was revised by Arrindell et al.⁴⁶ Jiang et al further revised the questionnaire in the context of Chinese culture.⁴⁷ The questionnaire contained three dimensions: rejection (6 items, such as "Father/mother often treats me in an embarrassing way", "Father/mother often punishes me more than I could accept", etc.), emotional warmth (7 items, such as "father/mother praises me", "father/mother always tries to encourage me to become a leader", etc.) and over-protection (8

items, such as "father/mother always decides what I should wear or dress up", "I feel that my father/mother interferes with anything I do", etc.). The scale was rated on a 4-point scale, ranging from 1 (never) to 4 (always). Jiang et al demonstrated that the scale had good reliability and validity.⁴⁷ Following the practice of prior research,⁴⁸ Liu et al conducted a principal component analysis of the established parenting style structure and found two higher-order factors: caring and control.⁴⁹ The emotional warmth was mainly loaded on the caring factor, while the parents' over-protection and rejection were mainly dependent on the control factor. To compare the parents' version to the children's version of the parenting style, this study used the structure proposed by Liu et al.⁵⁰ In this study, the Cronbach's α coefficients of the caring dimension and control dimension of the scale were 0.66 and 0.73 (father), 0.59 and 0.75 (mother) respectively. The split-half reliability coefficients were 0.69 and 0.72 (father), 0.64 and 0.80 (mother) respectively.

Academic Performance Measure

Academic achievement was accessed by a single item "Where do you rank your academic performance in your class?". It was rated on a 5-point scale, with "1 = top 20%", "2 = top 20%-40%", "3 = top 40%-60%", "4 = top 60%-80%", and "5 = bottom 20%". And the rating score was reversed, the higher the score, the more excellent one is in terms of the academic performance. Previous studies have demonstrated students' self-reported academic ranks were highly consistent with official records of their academic performance. Self-report could reflect their true academic achievement.^{51,52}

Demographic Variables Measure

Participants' demographic information were gathered, including participants' sex, participants' age, parents' education, perceived family economic status, and number of siblings in their families.

Procedure

First, the researcher mailed the questionnaires to the research assistant. Second, the research assistant distributed the questionnaire to the students and requested them to finish the questionnaire based on their own perceptions. Finally, the students submitted the completed questionnaire to the research assistant, who then returned the questionnaires to the investigator afterwards.

Parental informed consent was obtained for all participants in the study.

Data Analysis

The software SPSS 19.0 was used for the data analysis. First, the overall data was performed in a correlation analysis. Second, a stepwise regression analysis was used to explore the moderation of parent sex on the relationship between the perceived parent-child facial resemblance and academic performance. Finally, a mediation effect test was adopted to explore the mediating effect of the father's caring parenting style on the relationship between perceived father-child facial resemblance and child's academic performance.

The missing data was handled with the List wise method. Harman's single factor test was used to test the common method bias.⁵³ The results showed that the first factor explained by the unrotated and rotated variables were 18.56% and 13.38%. Both were below the critical 40% threshold. Therefore, the common method bias effect was not significant in this study.

Besides, since the sample size was not calculated before the current study, G-Power software was used to conduct post hoc power analysis.^{54,55}

Results

Descriptive Analysis

As shown in Table 1, the father-child facial resemblance, rather than mother-child facial resemblance, correlated with child's academic performance significantly. Besides, the father-child facial resemblance significantly correlated with the caring factor in the father's parenting style, and the caring factor in father's parenting style correlated with the academic performance significantly. Consist with the hypotheses, neither the relationship between father control parenting and father-child facial resemblance nor the relationship between mother control parenting and mother-child facial resemblance was not significant, thus, the control parenting was not concerned in the regression analysis.

Moderation of Parents' Sex

A stepwise regression analysis was conducted, with perceived father-child facial resemblance being the predictor, child's academic performance being outcome variable, and participants' sex, age, parents' education, perceived family economic status, number of siblings being the control

Table 1 Descriptive Statistics and Correlations Among Key Variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	—											
2. Number of siblings	0.159	—										
3. Father's educational years	-0.053	-0.190*	—									
4. Mother's educational years	-0.124	-0.104	0.593***	—								
5. Perceived family economic status	0.013	-0.036	0.146	0.265**	—							
6. Perceived father-child facial resemblance	0.063	-0.105	0.122	0.044	0.081	—						
7. Perceived mother-child facial resemblance	-0.040	-0.070	0.015	0.074	0.042	-0.197*	—					
8. Father's caring parenting	-0.138	-0.015	0.188*	0.055	0.174	0.258**	-0.016	—				
9. Father's control parenting	0.089	-0.033	0.127	0.067	-0.077	-0.188	-0.064	-0.223**	—			
10. Mother's caring parenting	-0.078	-0.045	-0.039	-0.127	0.091	0.127	0.087	0.458***	-0.003	—		
11. Mother's control parenting	0.152	0.200*	0.151	0.268**	0.061	-0.085	-0.172	-0.097	0.291**	-0.366***	—	
12. Academic performance	-0.097	0.043	0.056	0.036	0.161	0.225**	0.018	0.333***	-0.340***	0.195*	-0.242**	—
M	14.14	2.27	9.55	8.63	3.98	5.96	5.33	2.59	1.61	2.72	1.80	3.53
SD	0.68	0.90	3.65	3.09	0.86	1.83	2.21	0.67	0.36	0.62	0.44	1.24

Note: ***p < 0.001, **p < 0.01, *p < 0.05.

variables. As shown in Table 2, perceived father-child facial resemblance significantly predicted child's academic performance. The post-hoc power analysis showed that $1 - \beta$ was 0.96, indicating that the effects in the current study can be significantly detected.

In the same way, a multiple regression analysis was performed to investigate the effect of perceived mother-child facial resemblance on the child's academic performance. As shown in Table 3, the effect of perceived mother-child facial resemblance is not significant.

Following Yu et al and Sun suggestion, a t -test [The t -test was conducted by the formula $t = (B_1 - B_2) / \sqrt{((SEB_1^2 * SEB_2^2 * (df_1 - 1) + SEB_2^2 * SEB_1^2 * (df_2 - 1)) / (df_1 + df_2 - 2))}$. NOTE: B_1 is the unstandardized regression coefficient of Perceived father-child facial resemblance on the father-child closeness, the SEB_1 is the standard error of B_1 , df_1 is the freedom degree of the B_1 ; B_2 is the unstandardized regression coefficient of Perceived mother-child facial resemblance on the mother-child closeness, the SEB_2 is the standard error of B_2 , and df_2 is the freedom of the B_2 .] was conducted to explore the

Table 2 The Effect of Perceived Father-Child Facial Resemblance on Academic Performance

Predictive Variable	Outcome Variable: Academic Performance							
	Model 1				Model 2			
	B	SE _B	t	p	B	SE _B	T	p
Intercept	3.323	2.757	1.206	0.231	2.787	2.700	1.032	0.304
Sex	0.304	0.255	1.190	0.237	0.358	0.250	1.430	0.156
Age	-0.103	0.182	-0.568	0.571	-0.129	0.178	-0.727	0.469
Number of siblings	0.074	0.135	0.550	0.584	0.102	0.132	0.770	0.443
Father's education	0.017	0.034	0.488	0.627	0.006	0.034	0.168	0.867
Perceived family economic status	0.220	0.137	1.603	0.112	0.202	0.134	1.508	0.135
R^2	0.052							
Perceived father-child facial resemblance					0.157	0.063	2.492	0.014
R^2					0.105*			
ΔR^2					0.053*			

Note: *p < 0.05.

Table 3 The Effect of Perceived Mother-Child Facial Resemblance on Academic Performance

Predictive Variable	Outcome Variable: Academic Performance							
	Model 1				Model 2			
	B	SE _B	t	p	B	SE _B	T	P
Intercept	3.602	2.764	1.303	0.195	3.438	2.824	1.218	0.226
Sex	0.332	0.254	1.308	0.194	0.345	0.258	1.336	0.184
Age	-0.109	0.182	-0.598	0.551	-0.104	0.183	-0.570	0.570
Number of siblings	0.058	0.132	0.441	0.660	0.060	0.133	0.451	0.653
Mother's education	-0.019	0.042	-0.450	0.653	-0.020	0.043	-0.480	0.632
Perceived family economic status	0.248	0.140	1.769	0.080	0.248	0.141	1.759	0.081
R^2	0.053							
Perceived mother-child facial resemblance					0.017	0.054	0.315	0.753
R^2					0.053			
ΔR^2					0.000			

moderating effect of parents' sex on the relationship between the perceived parent-child facial resemblance and child's academic performance.^{38,56} Results showed that the effect of perceived father-child facial resemblance on the child's academic performance was significantly higher than the effect of perceived mother-child facial resemblance, $t(222) = 2.39, p < 0.05$, Cohen's $d = 0.32$. These findings attest to the hypothesis that parents' sex would moderate the relationship between the perceived parent-child facial resemblance and child's academic performance.

Mediation of Caring Parenting Style

We adopted the model 4 of PROCESS macro to examine the mediating effect of father's caring parenting on the association between the perceived father-child facial resemblance and child's academic performance. We used the perceived father-child facial resemblance as an independent variable, academic performance as a dependent variable, care parenting as a mediator, and the participants' sex, age, parents' education, perceived family economic status, and the number of siblings as control variables. As shown in Figure 2, while controlling for the sex, age, number of siblings, father's education, and the perceived family economic status, the perceived father-child facial resemblance significantly predicted the academic performance. However, when the father's caring parenting style enters the equation, the effect of the perceived father-child facial resemblance on child's academic performance was reduced to non-significant. The mediation effect Sobel test was significant, $z = 1.98, p < 0.05$, 95% bootstrap CI = [0.011, 0.127], not including zero. Notably, the mediation effect accounted for 38.1% of the total effect (see

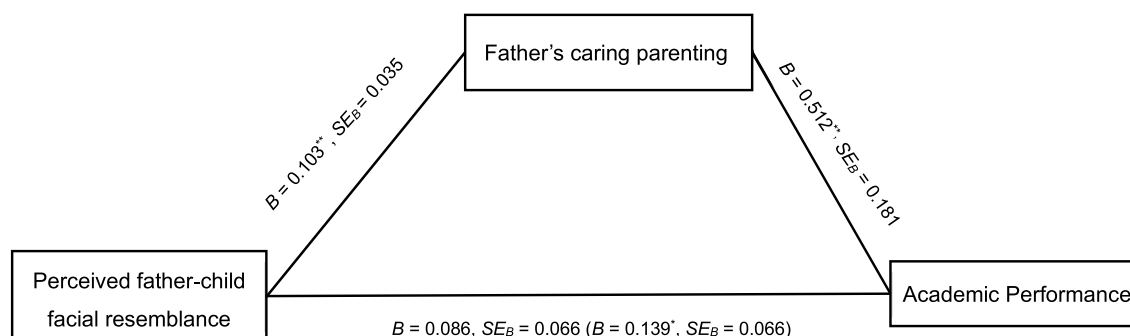
Figure 2). Thus, father's caring parenting style fully mediated the relationship between the perceived father-child facial resemblance and child's academic performance.

Discussion

This study demonstrated that the perceived father-child facial resemblance could affect child's academic performance and this effect was accounted for by the father's caring parenting, which not only supported the paternal uncertainty hypothesis^{4,5,7,12,13} but also extended the parental investment theory.^{2,5,14}

This research collected data from the monogamous family. Consistent with the previous study in a polygynous human population of rural Senegal,⁴ paternal investment was positively related to the father-child facial resemblance. Due to the female infidelity, the probability of paternity can vary among children.⁵⁷ Fathers need adjust the paternal investment, because they may invest a child who did not have any relationship with them. The evolution in response to paternity uncertainty make them seek cues that characterize their genetic identity, such as, facial resemblance,^{4,5} body odor resemblance.⁴ Fathers tend to adjust resource investment on the children according to the degree of father-child facial resemblance,^{4,7,58} which further affects the development of children.^{4,5,13,24,25}

The present study found that the perceived father-child facial resemblance could affect child's academic performance through the pathway of the father's caring parenting style. This is consistent with the previous findings showing that perceived father-child facial resemblance significantly predicted the physiological development of



Notes: ** $p < .01$, * $p < .05$.

Figure 2 The mediating effect of father's care parenting between the perceived father-child facial resemblance and academic performance.

the offspring in the primitive tribes of Senegal.⁴ However, when Alvergne replicated her study in France, the influence of perceived father-child facial resemblance on child's physiological development was not significant.⁵ Alvergne et al argued that in the developed countries, even though fathers did not invest much on their children, the mothers' investment was sufficient for the healthy development of the offspring.⁵

While Alvergne et al studies showed that father's material investment could be substituted by mother's material resources,⁵ this study focused on the father's emotional investment, which might not be substituted by mother's emotional support. Ryan, Martin, and Brooks-Gunn found that children who received more support from fathers scored higher in mental developmental index.⁵⁹ Other researchers found that children could be braver when encountering challenges in life due to the fathers' caring and support.^{60,61} Even though the current participants were recruited in an economically developed city, this study still found that the fathers' "caring parenting mediated the effect of perceived father-child facial resemblance on child's academic development. In a word, the effect of perceived father-child facial resemblance on offspring's survival and growth through emotional investment were stronger and more stable than through material investment.

Although this study found that father-child facial resemblance can significantly affect the father's parenting style, the effect is still low. As shown in Table 3, the facial similarity between father and child can only explain 5.3% variation of father's caring parenting style. In addition, father's caring parenting style may also be affected by other factors, no matter from the father's perspective or the children. Eg, the father's personality,⁶² social class,¹⁷ cultural background,⁶³ father's relationship with mother,⁶⁴ the child's personality⁶⁵ and physical health,⁵⁷ etc. Therefore, the results of this study should be treated rationally and objectively.

It is noting that this research demonstrated greater parental care and lower control related with adolescent higher academic performance, which was in line with results conducted in the previous studies.⁶⁶⁻⁶⁸ In fact, the benefits of greater caring are found both in the Eastern Culture⁶⁹⁻⁷¹ and in the Western Culture.^{27,72} However, this research found parental control had a negative impact on the academic performance, which is inconsistent with some previous studies in Eastern Culture.⁶⁹⁻⁷¹ Chao found that Chinese American adolescents from strictness without warmth

families reported the better academic achievement.⁶⁹ And some studies, conducted in China, found that both warmth and control are beneficial and more conducive to improving children's academic performance.^{70,71} Maybe, the different definition of the parental control could account for the controversy. As suggested by Liu et al⁴⁹ the present study referred the control parenting as parents' neglect and rejection, which has a negative correlation with the academic performance.^{24,72} However, previous studies consider the control dimension as strictness, which reflects the parental attention to the child and their behavior norms.^{57,72} Many studies demonstrated that the strictness could promote children's academic performance in the Chinese cultural context.⁶⁹⁻⁷¹ Thus, the controversy was not essential.

Although this study provided consistent evidence for our hypotheses, there were several limitations. First, the self-reported academic performance could be susceptible to social desirability biases, such as the self-serving bias, even though past literatures have reported adequate validity and reliability.^{51,52} For example, participants' mean self-reported rank was 3.53 in the present sample, which was significantly higher than the mid-point (3.0), $t = 4.61$, $p < 0.001$. Thus, future research may use the objective indicators, such as GPA (grade point average), rather than the self-reported performance in validating the relationship between the father-child facial resemblance and child's academic achievement. Second, the current study adopted a cross-sectional design, which had a natural deficiency to deduce the causal relationship between independent variable and dependent variable, this study posited that father's caring parenting mediated the relationship between father-child facial resemblance and academic performance, however, there is a possible alternative explanation: offspring perceived themselves more look like his or her father when the offspring imitate with his or her father, thus, further study could use a longitudinal approach to enhance the internal validity. Third, due to the change of the adolescent self-concept⁷³ and the greater need for bonding with friends,²⁹ parental influence to adolescent declined while peer influence increased.⁷⁴ Although the parenting style is still important for adolescent academic performance, future studies should consider the peer influence as a control variable. Finally, child's academic achievement is highly valued in Asian culture since it represented the honor of the whole family.⁷⁵ For other countries and regions with different cultural backgrounds, the influence of perceived parent-child facial resemblance on child's academic performance may not

hold. Thus, future studies could adopt different countries and ethnic groups to explore the potential influence of culture on the relationship between the perceived father-child facial resemblance and child's academic achievement.

Conclusion

This study explored the relationship between the perceived parent-child facial resemblance and child's academic performance. Those results showed that the perceived father-child facial resemblance rather than the perceived mother-child facial resemblance influenced the child's academic achievement, and this effect could be explained by the father's caring parenting style. These findings not only corroborated the paternal uncertainty hypothesis but also extended the parental investment theory.

Ethics

The present study received approval from the psychological research ethics committee of the Faculty of Human-Environment Studies at Beijing Normal University (16JJD880007).

Parental Informed Consent

Parental informed consent was obtained for all participants under the age of 18, in accordance with the Declaration of Helsinki.

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Disclosure

The authors report no conflicts of interest in this work.

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