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The relationship of real-life interpersonal difficulties and Chinese adolescents' online deviant behavior: a U-shaped mediated moderating effect of online morality

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Based on the integrated perspective of reality and virtual networks, this study aims to explore the mechanism of how interpersonal difficulties influence Chinese adolescents' online deviant behavior and the roles of online morality and online social support in this relationship. A questionnaire containing four psychological scales was administered to 1,120 Chinese adolescents, and the meditating and moderating effects were analyzed using structure equation modeling. The results show that (1) Real-life interpersonal difficulties and online social support can significantly increase online deviant behavior, whereas online morality can significantly decrease such behavior. (2) There is a U-shaped mediated moderating effect: The recovering effect of morality for the impact of interpersonal difficulties on online deviant behavior is only effective for individuals with high moral levels and mild interpersonal difficulties; however, once interpersonal difficulties exceed the critical threshold, online deviant behavior will surge, particularly among individuals with high online morality. (3) There is a moderated mediating effect: Online social support is a mediator between interpersonal difficulties and online deviant behavior, and online morality can negatively moderate the impact of online social support on online deviant behavior. Furthermore, this study also proposed a theoretical model to explain how online deviant behavior happens, which can be used to control and reduce online deviant behavior.

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Introduction

Online deviation behavior pertains to the action of internet users violating or destroying established norms for network behavior, including network verbal deviation, network social deviation, network pornography deviation, and network application deviation (Li et al., 2008; Wang et al., 2017b; Wang et al., 2020). In recent years, numerous public opinion events have appeared on China's internet and threatened the harmony and serenity of Chinese society, such as the deceptive advertising by internet celebrities, and the online disinformation about COVID-19, etc. In response, the Chinese Internet Cleanup Campaign reported in 2021 that the government had eliminated over 155 thousand detrimental online communications and shut down over 6,400 illegal websites. However, online deviant behavior remains a serious concern. Given the fact that Chinese culture places a strong emphasis on morality's power to constrain behavior, it is worthy to discover a psychological solution to decrease teenagers' online deviation behaviors in China.

As the Internet can eliminate geographical distance and reduce the opportunities for face-to-face communication between people in real life, individuals tend to pursue virtual social circles to avoid interpersonal conflicts in real life (Wu and Li, 2002). Furthermore, the network may free the constraints of morality and then decrease the capacity of consciousness to control both mental processes and behavior. As a result, the role of unconsciousness increases, making it easier to induce deviant behaviors in adolescents. However, previous research on online deviation behaviors has paid little attention to individual factors in both real and online life; therefore, it merits further investigation whether interpersonal relationships in real life influence online deviation behaviors (Klein and Cooper, 2019; Zhou and Feng, 2019; Choi and Lee, 2017).

Based on the aforementioned research statements, this study seeks to investigate the effect of real-world interpersonal difficulties on the online deviant behavior of Chinese adolescents, focusing on the mechanisms between online social support and online morality. The research questions are as follows:

1. Can real-world interpersonal difficulties, online social support, and online morality influence Chinese adolescents' online deviant behavior?
2. How can online morality and online support influence the relationship between real-world interpersonal problems and online deviant behavior?

Following is the remainder of the manuscript. Section "Literature Review and Hypotheses" provides a literature review and hypotheses. The method is introduced in section "Methodology", followed by illustrations of statistical analysis and results in section "Results", and a discussion in section "Discussion". Finally, the study's conclusions are presented in section "Conclusion".

Literature review and hypotheses

Interpersonal difficulties. Interpersonal difficulties refer to the social obstacles that teenagers encounter in real-life interpersonal communication, which are mainly in interpersonal conversation, interpersonal friendship, interpersonal reception, and opposite-sex communication (Liu, 2021). According to the interpersonal relationship theory, personality development is a process of expanding interpersonal relationships, and individuals can only endure and develop in interpersonal contexts (Guo, 2017). If individuals encounter problems or setbacks in interpersonal relationships in the actual world, they may pursue alternative solutions, and the Internet is likely to be a breakthrough for them (Wu and Li, 2002). For instance, the tension between classmates will result in malevolent remarks on the Internet, and couples

who are dissatisfied with their romantic relationships will seek stimulation online. Moreover, individuals with real-world interpersonal distress may attempt to satisfy their own needs in the network, thereby displaying distinct dual personality traits in reality and the network (Jin et al., 2016; Jin et al., 2017a). Under the influence of egocentrism in adolescence, adolescents may over-present themselves in the network and use various strategies for self-exhibition to obtain a favorable impression (Goffman, 1959), which leads them to construct their virtual personality online and ultimately increases the probability of online deviant behaviors. Consequently, the first hypothesis can be derived.

H1. Real-life interpersonal difficulties may increase online deviant behavior.

Online social support. Online social support refers to the degree to which individuals feel understood and respected in their emotions and communication, and thus gain a sense of identity and belonging online (Hu et al., 2014). Since interpersonal relationships in the online environment may transcend age, gender, and occupation, researchers typically utilize online social support as a key indicator of their network's interpersonal relationships (Jin et al., 2017a). The majority of studies generally consider social support as a positive factor for mental health. For example, the buffer theory suggests that social support can mitigate the negative effects of stress on an individual's physical and mental health (Alloway and Bebbington, 1987). However, in the online environment, deviant behavior may be encouraged and magnified as a result of the desire to attract the attention and support of followers, resulting in irrational behavior. For example, the Chinese online celebrities "Bubble Dragon" and "Three Thousand Brothers" ate or drank excessively for their fans, resulting in dysfunctional bodily function and death. In short, online social support may contribute to the rise of online deviant behavior. Moreover, given that individuals with interpersonal difficulties are more likely to anticipate online social support and that this support may amplify their deviant behaviors, online social support may serve as a mediator between interpersonal difficulties and online deviant behaviors. Consequently, the two hypotheses can be derived.

H2. Online social support may contribute to an increase in online deviant behavior.

H3. Online social support may mediate the effect of interpersonal difficulties on online deviant behavior.

Online morality. Online morality refers to the norms of behavior that take good and evil as the standard, evaluate people's online behavior through social opinions, inner beliefs, and traditional habits, and regulate the relationship between people and individuals and society in the network space and time (Yue, 2022). The level of individual compliance with this code represents the level of their online morality. According to psychoanalytic theory, the superego adheres to moral principles, and morality naturally constrains deviations from the norm; therefore, can online morality play the same role in their online behavior as real-world morality? Online morality is an extension and expansion of real-world morality, and its rapid development has reshaped modern consciousness and the ethical spirit, forging new interpersonal and ethical relationships (Ma and Lei, 2010; Du, 2012). Due to the anonymity and decentralization of the online environment, the control of consciousness over one's mind and behavior is weakened, thereby increasing the role of unconscious factors, making it easier to induce online deviant behaviors. Particularly for adolescents, online morality can play a mitigating role in this scenario.

For adolescents with low levels of online morality, self-control is weak, and real-life interpersonal difficulties will cause them to seek more online social support, which is more likely to trigger violent, aggressive, deceptive, and other biased behaviors; for adolescents with high levels of online morality, self-control is strong, and when confronted with real-life interpersonal difficulties without relying on online support, they will employ the "gentlemen's approach" to resolve issues (Jin et al., 2018). Moreover, adolescents generally anticipate having their own online space that is filled with supportive followers, which may encourage deviant behavior. In this instance, online morality will play a crucial role in behavior regulation. In particular, individuals with high levels of online morality will control and rectify themselves on time. Consequently, the three hypotheses can be derived.

H4. Online morality may decrease online deviant behaviors.

H5. Online social support may negatively moderate the effect of interpersonal difficulties on online deviant behaviors.

H6. Online morality may negatively moderate the influence of online social support on online deviant behaviors.

The proposed model. Based on the aforementioned hypotheses, Fig. 1 depicts the proposed model. (1) Real-world interpersonal difficulties will increase online deviant behavior through online social support. (2) Online morality can negatively moderate the impact of online social support on online deviant behaviors. (3) Online morality can also negatively moderate the impact of interpersonal difficulties on online deviant behaviors, and this moderating effect can be mediated by online social support.

Methodology

Participants and procedures. This study employed four well-designed psychological assessments on the online questionnaire platform Wenjuanxing (https://www.wjx.cn) to survey students from five high schools and three universities in the eastern provinces of China. To ensure the representativeness of sampling, students' genders, the teaching quality of schools, and the ratio of Chinese urban and rural populations were considered. More specifically, an evenly distributed sampling approach was used to control the differences between genders and schools, and regarding the data provided by the National Bureau of Statistics of China in 2021, the students from urban and rural areas were sampled at a ratio of 6.4:3.6. Given above principles, the convenient sampling method was used to collect data by class. In addition, a power analysis using the R package WebPower (Zhang and Yuan, 2018) was performed to estimate the required sample size. To provide adequate power (95%), a sample of 172 examinees was required to detect a medium effect size of $f^2 = 0.15$.

Before distributing the questionnaire, participants were informed of their rights, the purpose of the study, and the degree of confidentiality of their personal information, so their participation in the study was entirely voluntary. The final sample collection yielded 1120 valid samples (486 men and 634 women; mean age = 18.68, standard deviation = 1.17), of which

64.5% were high school students, and 35.5% were college students. Moreover, 67.8% of the students were from urban areas, while 32.2% were from rural areas.

Measurement tools. The development and validation of all four scales was based on Chinese culture. To facilitate comprehension, this part will not only illustrate the reliability and validity of these scales but also provide translated examples of indicators for each dimension in Table 1.

Cyber Deviant Behavior Scale. The cyber deviant behavior scale developed by Zhang (2015) was a 5-point Likert scale with 19 items to measure the level of students' online deviant behaviors, including four dimensions: Cyber-intercourse deviance behaviors, cyber-speech deviance behaviors, cyber-use deviance behaviors, and cyber-pornography behaviors. In the current investigation, this scale showed acceptable internal consistency reliability and structural validity (Cronbach's $\alpha = 0.945$, CFI = 0.996, TLI = 0.995, RMSEA = 0.035, SRMR = 0.024).

Interpersonal Comprehensive Diagnostic Scale. The interpersonal comprehensive diagnostic scale developed by Zheng (1999) was a true or false scale with 28 items to measure the level of students' interpersonal difficulties in real life, including 4 dimensions: Communicating with others, making friends, treating people, and communicating with the opposite sex. In the current investigation, this scale showed acceptable internal consistency reliability and structural validity (Cronbach's $\alpha = 0.920$, CFI = 0.941, TLI = 0.930, RMSEA = 0.058, SRMR = 0.098).

Online Social Support Scale. The online social support scale developed by Liang and Wei (2008) was a 5-point Likert scale with 23 items to measure the level of students' online social support, including 4 dimensions: Emotional support, tangible aid, informational support, and social network support. In the current investigation, this scale showed acceptable internal consistency reliability and structural validity (Cronbach's $\alpha = 0.968$, CFI = 0.956, TLI = 0.950, RMSEA = 0.121, SRMR = 0.014).

Internet Morality Scale. The Internet morality scale developed by Luo (2007) was a 7-point Likert scale with 7 items to measure the level of students' online morality, including 3 dimensions: Internet moral cognition, internet moral attitude, and Internet moral behavior. In the current investigation, this scale showed acceptable internal consistency reliability and structural validity (Cronbach's $\alpha = 0.867$, CFI = 0.990, TLI = 0.981, RMSEA = 0.081, SRMR = 0.014).

Data analysis

Control of common method bias. To control the common method bias, statistical analyses were conducted on all 77 items using Harman's single-factor test after data collection. Eleven factors had eigenvalues greater than one, and the first factor accounted for less than 40% of the variance, indicating that common method bias was not significant. Moreover, all data were analyzed with SPSS 23.0 and Mplus 8.4.

The scoring method for the constructs. To reduce measurement errors and simplify the hypothesis model, all Likert-scale or true/false responses were treated as categorical data. In addition, rather than relying on the traditional aggregate of observed scores, the construct of four scales was represented by standardized factor scores. In particular, the factor scores were calculated using the Expected A Posteriori (EAP) algorithm, which was based on the latent variables from the confirmatory factor analysis.
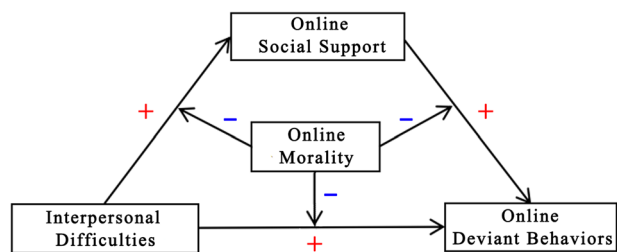

Fig. 1 The proposed model.

Table 1 The sources of indicators.

Construct	Tools	Dimensions	Example Indicators
Online deviant behaviors	Cyber deviant behavior scale with 19 items (Zhang, 2015)	Cyber-intercourse deviance behaviors	Exposing your privacy to strangers online.
		Cyber-speech deviance behaviors	Verbally attacking others online.
		Cyber-use deviance behaviors	Posting or reposting false news online.
		Cyber-pornography behaviors	Browse pornographic websites.
Interpersonal difficulties	Interpersonal comprehensive diagnostic scale with 28 items (Zheng, 1999)	Communicating with others	With a large group, you often feel lonely or lost.
		Making friends	It doesn't feel natural for you to meet strangers.
		Treating people	Always hurt others' feelings.
		Communicating with the opposite sex	Do not know how to get along better with the opposite sex.
Online social support	Online social support scale with 23 items (Liang and Wei, 2008)	Emotional support	Through blogs and Spaces, you can share thoughts, feelings, and experiences with others
		Tangible aid	You can exchange things with people through the Internet
		Informational support	Through network communication, you can get some learning materials from others.
		Social network support	You can find friends and share common interests on the Internet
Online morality	Internet morality scale with 7 items (Luo, 2007)	Internet moral cognition	Although the network society is virtual, it should also have its universal moral norms.
		Internet moral attitude	Even attacking someone in a chat room is unethical.
		Internet moral behavior	Even if people don't know about it, you won't have an online burglary.

Table 2 The correlation coefficients between observed and factor scores of constructs ($N = 1120$).

Construct	1	2	3	4
1. Online deviant behaviors	0.849[***]	0.199[***]	0.340[***]	−0.217[***]
2. Interpersonal difficulties	**0.274**[***]	0.973[***]	0.177[***]	−0.074[*]
3. Online social support	**0.382**[***]	**0.220**[***]	0.978[***]	0.141[***]
4. Online morality	**−0.200**[***]	**−0.068**[*]	**0.120**[***]	0.964[***]

[*]$p < 0.05$, [***]$p < 0.001$; the bold numbers in the lower triangle are the correlations between factor scores, the numbers in the upper triangle are the correlations between observed scores, and the numbers in the diagonal line are the correlations between observed and factor scores.

The mediating and moderating effects. Both mediating and moderating effects were examined using the structure equation modeling framework. For the mediating effect, the test of joint significance and the bootstrap test (2,000 bootstrap iterations) were employed (Taylor et al., 2008). For the moderating effect, the significant test for the standardized product term of two or three concerning standardized variables was conducted. Furthermore, five models were constructed sequentially to test the hypothesis, but only the optimal model was used to explain the specific mediating and moderating effects.

Results
Correlation and demographic analysis. The correlation coefficients between observed and factor scores of four constructs are presented in Table 2 to validate the use of factor scores and hypothesis. All coefficients are significantly correlated, and two conclusions can be drawn: (1) The correlations between observed and factor scores in the diagonal line are very high (0.849–0.978), indicating that scoring methods for the constructs are available. (2) The correlation coefficients calculated from the factor scores in the lower triangle are, on average, greater than those calculated from the corresponding observed scores in the upper triangle, indicating that the factor scores may contain fewer measurement errors.

Table 3 displays the descriptive statistics for four distinct constructs. The demographic analysis shows that: (1) Females have significantly fewer online deviant behaviors ($t = -8.156$, $p < 0.001$) and higher online morality ($t = 5.903$, $p < 0.001$) than males; (2) Rural students have significantly fewer online deviant behaviors ($t = -2.411$, $p < 0.05$) and online social support ($t = -3.772$, $p < 0.001$) than urban students; and (3) College students have significantly higher online deviant behaviors ($t = 4.347$, $p < 0.001$), interpersonal difficulties ($t = 2.761$, $p < 0.01$), online social support ($t = 3.348$, $p < 0.001$), and online morality ($t = 2.248$, $p < 0.05$) than high school students. These results indicate that all three demographic factors may have an obvious influence on the constructs, which should be considered when testing hypothetical models.

Multiple models for testing mediating and moderating effects. For the convenience of expression, let *behaviors* denote the dependent variable of online deviant behaviors, *difficulties* denote the independent variable of interpersonal difficulties, *support* denote the mediation variable of online social support, *morality* denote the moderation variable of online morality, *mor_diff* denote the product term of *morality* and *difficulty*, *diff2* denote the square of *difficulty*, *mor_diff2* denote the product term of *morality* and *diff2*, *mor_sup* denote the product of *morality* and

Table 3 The mean and standard deviations of four constructs ($N = 1120$).

Construct	Gender		Home		Grade	
	Male	**Female**	**Urban**	**Rural**	**High school**	**College**
1. Online deviant behaviors	0.28 (1.12)	−0.21*** (0.84)	0.10 (1.02)	−0.05* (0.99)	−0.09 (1.00)	0.17*** (0.96)
2. Interpersonal difficulties	0.04 (1.08)	−0.03 (0.93)	0.00 (1.02)	−0.00 (0.99)	−0.05 (1.01)	0.11** (0.95)
3. Online social support	0.04 (1.03)	−0.03 (0.98)	0.17 (1.06)	−0.08*** (0.96)	−0.07 (1.01)	0.13*** (0.97)
4. Online morality	−0.20 (1.07)	0.16*** (0.91)	0.02 (0.96)	−0.00 (1.01)	−0.05 (1.04)	0.09* (0.91)

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

support. Step-by-step testing of the research hypothesis was conducted using five models, the results of which are presented in Table 4. Furthermore, Models 0, 1 & 2 were saturated, and only the model fits of Models 3 & 4 were reported.

Model 0 is the null model, which only considers demographic variables to control for irrelevant errors, and the results show that males ($\beta = 0.266$, $p < 0.001$) and college students ($\beta = 0.165$, $p < 0.001$) may have significantly higher online deviant behaviors (The Model 0). Based on the null model, Model 1 further considers the direct effects of relevant variables; the results indicate that interpersonal difficulties ($\beta = 0.166$, $p < 0.001$) and online social support ($\beta = 0.348$, $p < 0.001$) have a significantly positive influence on online deviant behaviors, whereas online morality ($\beta = -0.202$, $p < 0.001$) has a significantly negative influence. Furthermore, the coefficient of determination R^2 also increases from 9% to 28.6%, demonstrating that hypotheses H1, H2, and H4 have been verified.

Then, Model 2 further examines the moderating effects of online morality in conjunction with interpersonal difficulties and online social support, respectively. The results show that online morality can significantly moderate the influence of online social support on online deviant behaviors ($\beta = -0.193$, $p < 0.001$), but cannot directly moderate the influence of interpersonal difficulties ($\beta = 0.030$, $p = 0.270$). Although the R^2 has increased from 28.6% to 31.8% and hypothesis H6 has been verified, the unsupportive results for hypothesis H5 have prompted researchers to build Model 3 in order to test whether the moderation effect for interpersonal difficulties can indirectly influence online deviant behavior.

The objective of Model 3 is to test whether online social support can mediate the impact of interpersonal difficulties and its moderating effects on online deviant behaviors ($\chi^2/df = 1.361/1$, $p = 0.243$, CFI = 0.999, TLI = 0.990, SRMR = 0.008, RMSEA = 0.018). The results show that online social support not only mediates the effect of interpersonal difficulties on online deviant behaviors ($\beta = 0.085$, $p < 0.001$, with a 95% confidence interval of [0.061, 0.114]), but also the moderating effect of online morality with interpersonal difficulties ($\beta = 0.033$, $p = 0.004$, with a 95% confidence interval of [0.010, 0.054]). Unfortunately, even though hypothesis H3 has been verified, the mediating effect appears to contribute only a 0.3% increase to R^2, prompting researchers to develop Model 4 to further investigate their relationship.

Based on Model 3, Model 4 considers the possibility of the U-shaped moderating effect of mor_diff2 ($\chi^2/df = 4.269/1$, $p = 0.039$, CFI = 0.994, TLI = 0.888, SRMR = 0.012, RMSEA = 0.054). The results show that the U-shaped moderating effect of interpersonal difficulties with online morality not only significantly influences online deviant behaviors directly ($\beta = 0.140$, $p = 0.006$), but also indirectly via online social support ($\beta = 0.035$, $p = 0.037$, with 95% confidence interval of [0.004, 0.070]). Compared to Model 2, the U-shaped moderating effect increases R^2 by 1.3%, which is obviously larger than those

from linear effects. Thus, hypothesis H5 has been verified in an unexpected but reasonable direction, and the simplified final model has been plotted in Fig. 2.

To further check the robustness of Model 4, a subsample consisting of 500 examinees which randomly sampled from the total samples was tested to replicate the results of Model 4 ($\chi^2/df = 1.217/1$, $p = 0.270$, CFI = 0.999, TLI = 0.983, SRMR = 0.010, RMSEA = 0.021). The obvious changes between standard coefficients from the total sample to the subsample are depicted in Table 5. The results show that the majority of key effects from the subsample were consistent with those effects from the total sample except for demographic variables, which further supports the validation of the proposed models.

The explanation of mediating and moderating effects. When the interaction is significant, the main effect should be minimized in favor of the interaction. Based on the results of Model 4 from the total sample, this part will explain (1) the U-shaped mediated moderating effect of interpersonal difficulties and online mortality and (2) the moderated mediated effect of online social support and online mortality. Taking the mean plus/minus one standard deviation of the moderator online morality, the U-shaped mediated moderating effect and the moderated mediating effect were plotted in Figs. 3 and 4, respectively.

According to Model 4 and Fig. 3, two conclusions can be drawn regarding the U-shaped mediated moderating effect: (1) The recovering moderating effect of online morality with interpersonal difficulties for online deviant behavior is limited, and it is only effective for individuals with high online morality and mild interpersonal difficulties. More specifically, for individuals with high online morality, a weak degree of interpersonal difficulties cannot obviously increase their online deviant behaviors, but if their interpersonal difficulties exceed the critical threshold, their online deviant behavior will surge, particularly for individuals with high morality (slope = 0.211, $p = 0.005$). For individuals with low online morality, with increasing interpersonal difficulties, online deviant behaviors also tend to steadily grow (slope = −0.070, $p = 0.141$). (2) This moderating effect can also influence online deviant behavior via online social support (the direct effect is 0.140, the indirect effect is 0.035, and the mediating ratio is 20%).

According to Model 4 and Fig. 4, two conclusions can be drawn regarding the moderated mediating effect: (1) Online social support is a mediator in the relationship between interpersonal difficulties and online deviant behaviors (the direct effect is 0.182, the indirect effect is 0.093, the mediating ratio is 34%); (2) The mediator online social support can also collaborate with the moderator online morality. Specifically, for individuals with high online morality, online social support has a significant but relatively weak positive effect on online deviant behavior (slope=0.172, $p < 0.001$); For individuals with low online morality, online social support has a strong positive effect on online deviant behavior (slope = 0.529, $p < 0.001$).

Table 4 The standardized regression coefficients of 5 models step by step.

Model	Dependence	Predictors	β	t	R^2 (%)
Model 0	Behaviors	Male	0.266	9.355***	9
		College	0.165	5.821***	
		Urban	0.045	1.564	
Model 1 (Supportive for H1, H2, & H4)	Behaviors	Male	0.208	8.089***	28.6
		College	0.123	4.885***	
		Urban	0.013	0.507***	
		Difficulties	**0.166**	**5.335*****	
		Support	**0.348**	**13.968*****	
		Morality	**−0.202**	**−7.566*****	
Model 2 (supportive for H6 but unsupportive for H5)	Behaviors	Male	0.191	7.555***	31.8
		College	0.125	5.096***	
		Urban	0.012	0.480	
		Difficulties	0.174	5.894***	
		Support	0.354	14.121***	
		Morality	−0.268	−8.061***	
		mor_diff	**0.030**	**1.098**	
		mor_sup	**−0.193**	**−5.978*****	
Model 3 (supportive for H3 and indirectly H5)	Behaviors	Male	0.191	7.562***	32.1
		College	0.125	5.096***	
		Urban	0.012	0.482	
		Difficulties	**0.174**	**5.886*****	
		Support	**0.353**	**14.255*****	
		Morality	−0.268	−8.099***	
		mor_diff	**0.030**	**1.098**	
		mor_sup	**−0.193**	**−6.005*****	
	Support	Male	0.065	2.196*	9.5
		College	0.072	2.441*	
		Urban	0.107	3.603***	
		Difficulties	**0.239**	**7.688*****	
		Morality	0.143	4.530***	
		mor_diff	**0.092**	**2.815****	
Model 4 (supportive for U-shaped H5)	Behaviors	Male	0.180	7.020***	33.1
		College	0.125	5.054***	
		Urban	0.008	0.319	
		Difficulties	0.181	5.956***	
		Support	0.350	13.902***	
		Morality	−0.338	−8.925***	
		Mor_diff	−0.002	−0.066	
		Mor_sup	−0.178	−5.248***	
		Diff2	0.070	1.669+	
		Mor_diff2	**0.140**	**2.769****	
	Support	Male	0.063	2.121*	10.6
		College	0.068	2.302*	
		Urban	0.106	3.617***	
		Difficulties	0.264	8.288***	
		Morality	0.067	1.626	
		mor_diff	0.031	0.886	
		diff2	−0.071	−1.804+	
		mor_diff2	**0.099**	**2.140***	

$^+$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, bold denotes key variables for testing hypothesis.

Discussion

The U-shaped mediated moderating effect. Instead of the linear moderating effect, this study found that online morality has a U-shaped moderating effect on the prediction of interpersonal difficulties in online deviant behavior. Specifically, for adolescents with low online morality, there is a linear increase in their online deviant behavior as their interpersonal difficulties increase. However, for adolescents with high online morality, their online deviant behavior remains relatively low when their interpersonal difficulties are mild, but when the level of interpersonal difficulties exceeds a critical threshold, the control effect of online morality weakens significantly. In other words, as the level of real-
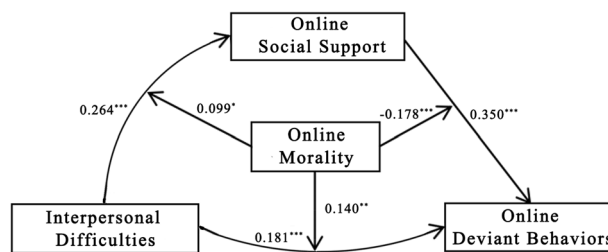

Fig. 2 The simplified final model.

Table 5 The robustness testing for Model 4 from the randomly sampled 500 examinees.

Dependence	Predictors	β	t	Changes	R^2 (%)
Behaviors	Male	0.148	3.811***		33.1
	College	0.113	3.053**	*** → **	→33.8
	Urban	−0.012	−0.322		
	Difficulties	0.155	3.939***		
	Support	0.322	8.705***		
	Morality	−0.415	−7.848***		
	mor_diff	0.031	0.682		
	mor_sup	−0.220	−5.496***		
	diff2	0.116	2.687**	+ → **	
	mor_diff2	0.149	2.453*	** → *	
Support	Male	0.026	0.565	* → $p = 0.572$	10.6
	College	0.032	0.745	* → $p = 0.456$	→8.6
	Urban	0.051	1.191	*** → $p = 0.234$	
	Difficulties	0.265	6.071***		
	Morality	0.030	0.481		
	mor_diff	−0.004	−0.085		
	diff2	−0.016	−0.306	+ → $p = 0.759$	
	mor_diff2	0.142	2.003*		

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, → means the changes from the total sample to the subsample.
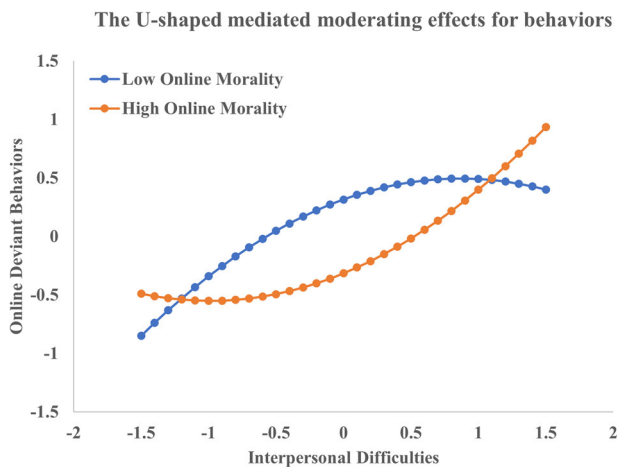
The U-shaped mediated moderating effects for behaviors

Fig. 3 The U-shaped mediated moderating effects for online deviant behavior.

The moderated mediating effects for behaviors
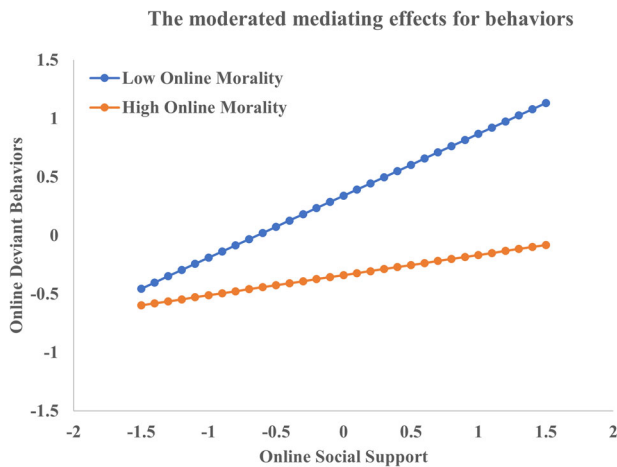
Fig. 4 The moderated mediating effects for online deviant behavior.

life interpersonal difficulties reaches a higher level, the moral principles of the superego gradually lose their effect.

Real-life interpersonal difficulties, online morality, and online deviant behaviors are logically related to the psychoanalytic theory of the id, superego, and ego (Li et al., 2016; Wang et al., 2017a). Specifically, the superego adheres to moral principles, the id adheres to pleasure principles, and the ego adheres to reality principles. When facing interpersonal difficulties, the basic ability of the id drives teenagers to choose aggressive, violent, or escape methods to release stress and anxiety, while the moral force of the superego controls the driving force of the id. When these two forces conflict intensify, especially when this conflict occurs in a free and equal space such as the internet, due to the immature development of adolescents' self-regulation, a large number of online deviant behaviors may emerge. This leads to the control of the superego over the id decreases, and then unconscious behavior increases, which will increase the online deviant behaviors in the online environment. Based on the above arguments, this study initially hypothesized that individuals with high moral levels should have fewer online deviant behaviors than those with low moral levels when facing interpersonal difficulties, although this hypothesis has been falsified by statistical analysis.

This suggests that researchers should be aware that simply improving online morality is not sufficient to solve the issue of online deviant behavior. Online morality often evaluates people's online behavior through social public opinion, inner beliefs, and traditional habits, regulating behavioral norms that govern relationships between individuals and society in cyberspace. However, due to the lack of centralization, hierarchy, and virtuality of the internet, especially when online identities are not real names, the binding power of network morality is far weaker than that of real-life morality (Ding et al., 2018). Additionally, real-life morality is easier to have a clear correspondence with laws and can be easily regulated, whereas legal blind spots on the internet are more prevalent, coupled with the lag in network legislation, making it more difficult to improve the binding power of online morality through network laws.

The moderated mediating effect. The results revealed that there is a moderated mediating effect of online social support in the

relationship between interpersonal difficulties and online deviant behavior. This indicates that not only can interpersonal difficulties influence online deviant behavior via the mediator online social support, but online morality can also moderate this mediation. The mediation effect is consistent with the buffer theory, which posits that social support can mitigate individual stress. High-interpersonal-difficulty individuals may seek social support on the Internet to alleviate their distress, as they seek to alleviate the feeling of isolation caused by the anonymity of the online environment (Wu and Li, 2002; Jin et al., 2017b). Therefore, individuals with greater interpersonal difficulties in the actual world may also have greater social support online. Guo et al. (2012) argued that network interpersonal relationships are an extension of interpersonal relationships in the real world, with individuals exhibiting similar characteristics in both contexts. However, this study found that individuals with higher levels of social support on the internet exhibit more online deviant behaviors. This is contrary to what occurs in real life, where people tend to keep their problems to themselves. This is analogous to having two aspects, one in the real world and one in the virtual world, where individuals feel secure sharing intimate thoughts and sentiments online but may not do so in reality.

In sociological studies, identity recognition is regarded as the source of motivation to act. Zhao (2018) suggested that identity recognition is a cognitive process of social comparison in which individuals gain a sense of commonality from their own group and difference from other groups, leading them to identify with a particular group and adopt its values and behaviors. Internet users establish a new community in which they communicate and practice recognizing their identities. When individuals encounter online content that aligns with their own beliefs, they are more likely to demonstrate empathy for those who hold similar views. For instance, many Internet users disregard the possibility of deception when perusing online posts seeking sympathy and tend to believe those who present themselves as vulnerable. This self-identification with these individuals results in a propensity to trust their stories and disseminate rumors that may or may not be true, but nevertheless attract attention. This is a form of online deviant behavior that has been exacerbated by the rise of online social support.

Besides, for individuals with high online morality, the increase of online social support has less incentive effect on online deviant behavior. This is due to the fact that individuals with high levels of online morality are still able to refrain from breaking the norms, even with the aid of others. In contrast, as social support increases, individuals with low levels of online morality tend to exhibit more deviant behavior. This is consistent with the cognitive dual-process theory, which suggests that in the online environment, moral constraints weaken and conscious control over one's thoughts and actions diminishes, leading to an increase in subliminal influences that can initiate online deviant behavior. When individuals adhere to online moral standards and control their behavior, online deviant behavior will decrease.

Demographic findings. The demographic analysis shows that Chinese college students have significantly more online deviant behaviors than high school students, male students are significantly more than female students, and urban students are significantly more than rural students. Compared to high school students, college students exhibit more online deviant behaviors. This contradicts the conclusion of existing research that first-year students exhibit higher deviant behaviors than those in higher grades (Goff and Goddard, 1999). This phenomenon is likely attributable to the stringent control of mobile phones in Chinese high schools, where students primarily access the internet after

class or on holidays. However, once they enter college, the internet follows them everywhere, and a mobile phone not only gives them a sense of control over the world, but also facilitates the reconstruction of empirical realities that are only possible in the virtual world. Simultaneously, parental distance, the presence of a generation gap, teacher alienation, and peer imitation all contribute to the absence of supervision and control over online deviant behavior. From this perspective, network literacy should be cultivated in basic education in advance, while adjustments are required to higher education teaching methods and evaluation systems with a strict entrance policy and a lax exit policy. Besides, male students' deviation behavior is significantly higher than that of female students, which is consistent with previous research (Higgins, 2006; Luo et al., 2011; Zhang, 2015).

Urban adolescents exhibit greater levels of online deviant behavior than their rural counterparts. This is partially because urban adolescents use the internet more frequently, but also because China's current internet culture is centered on urban culture, whereas rural culture has lower exposure rates, attention-grabbing rates, and click-through rates. In rural cultures, interpersonal relationships are immediate and concrete, based on kinship or geography, and negative influences on the rural ecosystem have inherently less of an effect.

Theoretical and practical implications. Based on the integrated perspective of reality and virtual networks, this study explores the relationship between interpersonal difficulties in reality and deviant behaviors on the network. By proposing a U-shaped mediated moderating model, this study takes online social support as a mediator and online morality as a moderator, and then tries to further explain the mechanism of online deviant behavior and provide a theoretical direction for future study.

This study can also offer empirical evidence for the education department to correctly guide students to surf the Internet rationally. In Chinese culture, moral restraint, introspection, and self-cultivation are especially emphasized. However, this study found when the practical interpersonal troubles of young people reach a certain level, the restraining effect of morality is no longer obvious. To make morality play a restrictive role in online deviant behaviors, it is necessary to ensure that the realistic interpersonal difficulties are at a mild level. For students with serious interpersonal relationship problems, families and schools should first identify their problems in what aspects, and effectively solve their needs. Moreover, interpersonal communication and interaction between students should be enhanced by playing group games or activities to increase the peer relationship. On the other hand, for students without interpersonal difficulties. online moral education should be considered to encourage students to use a positive way to surf the Internet.

Conclusion
Main contributions. The mechanism of online deviant behavior was enriched. Specifically, a U-shaped mediated moderating effect of online morality and a moderated mediating effect of online social support were demonstrated, which provides theoretical support for the intervention of teenagers' online deviant behavior. In general, real-life interpersonal difficulties and online social support can significantly increase online deviant behavior, whereas online morality can significantly reduce online deviant behaviors. This indicated that teenagers' interpersonal skills in real life and morality in online environments should both be continuously cultivated to avoid the encouraging effect of excessive online social support on online deviant behaviors.

Online social support is a mediator between interpersonal difficulties and online deviant behaviors, and online morality can

negatively moderate the impact of online social support on online deviant behaviors. Moreover, the recovering effect of online morality for the influence of interpersonal difficulties on online deviant behavior is only effective for those with high moral levels and mild interpersonal difficulties. However, the interesting is once interpersonal difficulties exceed the critical threshold, online deviant behavior will surge. This indicated that the education on teenagers' online deviant behaviors should be a different emphasis according to their aptitude for interpersonal difficulties and online morality. For teenagers with mild interpersonal difficulties, cultivating their online morality is an efficient method to decrease the encouraging effect caused by excessive online social support and finally reduce their online deviant behavior. Otherwise, for teenagers with obvious interpersonal difficulties, continuing to cultivate online morality may lead them to behave more extremely online, but it is a priority to teach interpersonal skills and let them establish good peer relationships in the real world.

Limitations and future direction. Although this study proposed a theoretical model to explain the relationship between real-life relationship difficulties, online deviant behaviors, online social support, and online morality for Chinese adolescents, it has limitations that require further research in the future. Firstly, this study has not yet conducted a longitudinal investigation of online deviant behavior. Therefore, longitudinal research methods can be considered when conducting intervention studies to assess the efficacy of interventions. Secondly, questionnaires were used to investigate this study, and the items are somewhat sensitive. Although respondents provided their responses anonymously, they may still exhibit high levels of social approbation, potentially concealing their true circumstances.

Future research could employ more efficient techniques, such as experiments, which would not only generate more objective data but also establish the causal relationships between variables. Lastly, despite the fact that this study considers both reality and network, it is uncertain how the complete mechanisms of reality and network interact. Future research could investigate whether there are differences in disposition between individuals in reality and network, the causes of these differences, and the distinctions and relationships between reality and network.

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request. In addition, the dataset also be uploaded to the system as a supplementary material for reviewing.

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Acknowledgements

Author contributions

YC: conceptualization; writing – original; funding acquisition; resources; data collection; research design; and investigation. SG: project administration; methodology; formal analysis; software; writing – original, review and editing; and validation. YY: data collection; writing – review and editing; and validation.

Competing interests

The authors declare no competing interests.

Ethical approval

The research was conducted ethically in accordance with the World Medical Association Declaration of Helsinki. The research was approved by the local ethics committees of the School of Educational Science of Liaocheng University (19YJC880011).

Informed consent

Informed consent was signed by participants.

Additional information

Supplementary information The online version contains supplementary material available at https://doi.org/10.1057/s41599-024-02664-8.

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