

Adolescent aggression and violent video games: The role of moral disengagement and parental rearing patterns

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ABSTRACT

Based on the General Aggression Model (GAM), this study which was crosssectional explored the relationship between VVGE and aggression in Chinese adolescents, taking into account the effects of individual difference trait (i.e., moral disengagement, anger, hostility) and family situation (i.e., parental rearing patterns). The study sample consisted of 630 Chinese adolescents ($Mage = 15.43$ years, $SD = 1.40$). Results showed that VVGE was positively associated with moral disengagement and adolescent aggression. Furthermore, when controlling for gender, moral disengagement played a partial mediating role between VVGE and adolescent aggression and physical aggression; anger and hostility played a partial mediating role between VVGE and physical aggression and a full mediating role between VVGE and verbal aggression. Father's preference and mother's denying of the parental rearing patterns moderated the relationship of moral disengagement on aggression. The findings suggest that moral disengagement, anger, hostility and parental rearing patterns may be the factors that increase in the risk of higher levels of adolescent aggression after repeated exposure violent video games.

1. Introduction

In China, the video game industry is booming. According to the China gaming industry report (China Audio video & Digital Publishing Association Game Publishing Committee, 2020). China had 654 million internet video gamers, and the penetration rate of online games among middle school student users was above 70.0%. Other relevant report has shown that in terms of online game duration, nearly one-third of young Internet users spend 1–2 h on a single game per day (China Internet Data Center, 2018). As has been previously noted, most of the video games that young players are particularly keen to play contain violence.

1.1. Violent video games exposure (VVGE) and aggression

Violent video games (VVG) are those that depict intentional attempts by individuals (nonhuman cartoon characters, real persons, or anything in between) to inflict harm on others (Anderson & Bushman, 2001). As video games can provide violent media with strong interactivity and realistic simulation, they are hugely popular around the world, especially in adolescents. Many cross-sectional and longitudinal studies have shown that VVGE increased adolescents' aggressive cognition, emotions, and behavior unconsciously, even possibility of forming aggressive personality (Han et al., 2020; Teng et al., 2019; Yao,

Zhou, Li, & Gao, 2019). Many empirical studies demonstrated a stable relationship, for example, VVGE increased aggressive behaviors in competitive reaction time task (Anderson, Buckley & Carnagey, 2008; Dowsett & Jackson, 2019; Hasan, Bègue, Scharkow, & Bushman, 2013). Many fMRI studies and meta-analyses found the impact of violence in video games on aggression (Anderson & Bushman, 2001; Anderson et al., 2010; Greitemeyer & Mügge, 2015; Szyck et al., 2017).

Theoretically, the General Aggression Model (GAM) proposed by Anderson can be used to explain this phenomenon (Anderson & Bushman, 2002, 2018). It is proposed in this model that the interaction between individual variables (e.g., attitude towards violence) and situational variables (e.g., contact with real-world violence or media containing violence) affects the one's internal state, then influences cognition, emotional experience, and physiological arousal. Each of these processes will affect individual thinking and decision-making process, eventually leading to aggression. GAM emphasizes three steps before aggression, and the repeating cycle of these steps will generate a cycle of escalation of violence and continuously increase the possibility of aggression.

To date, some studies have found that there were some underlying mechanisms existed in the relation between VVGE and aggression. For example, previous research has found that hostile, anger and rumination played roles as mediators, and impulsiveness and shyness played

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roles as moderators (e.g. Anderson & Bushman, 2018; Gentile et al., 2004, 2014; Tian, Gao, Wang, & Gao, 2019; Yao, Zhou, Li, & Gao, 2019). However, few studies have examined simultaneously the underlying mechanisms of the relationship between VVGE and aggression from both the perspectives of social cognition (i.e., moral disengagement) and family situation (i.e., parental rearing patterns); and few researches have investigated the potential effects of multiple mediators simultaneously. Such a comprehensive study could help game players to reduce the relation between VVGE and aggressive behaviors theoretically.

1.2. Moral disengagement as a potential mediator

Bandura proposed the concept of moral disengagement which is a cognitive bias to explain why individuals experience less guilt or painful reactions after immoral behavior, moral disengagement can help restructure an individual's conduct to make it appear less harmful, minimize their role in the outcome of their conduct, and reduce the distress that they cause others (Bandura, Barbaranelli, Caprara & Pastorelli, 1996; Bandura, 1999, 2002). Some studies have found correlation between VVGE and moral disengagement (Gabbiadini, Andrighetto, & Volpato, 2012; Hartmann & Vorderer, 2010; Teng, Nie, Guo, & Liu, 2017), and some longitudinal research has established a stable link between VVGE and moral disengagement (Teng et al., 2017, 2019) which found that VVGE in middle school and high school students has a significant positive predictive effect on moral disengagement, which means the more VVGE, the higher the level of moral disengagement is more likely to occur. Moral disengagement is not only a negative consequence of VVGE, but also an important predictor of aggression. Some cross-sectional and longitudinal studies have supported that moral disengagement mechanisms can make individuals reconstruct aggression cognitively of teenagers (Caprara et al., 2014; Gao, Weng, Zhou, & Yu, 2017; Hartmann, Krakowiak, & Tsay-Vogel, 2014; Teng et al., 2019; Yang & Wang, 2012), Gini, Pozzoli, & Hymel (2014) proved the relationship by meta-analysis.

According to the relationship between VVGE and aggression, moral disengagement as a potential mediator has been demonstrated through some studies. For example, Greitemeyer & McLatchie (2011) found that dehumanization is one of the moral disengagement mechanisms by which VVGE increase aggressive behavior. Another research in college students has found that moral disengagement wholly mediated the relationship between VVGE and aggression (Yao, Zhou, Li, & Gao, 2019). Teng et al. (2019) found that VVGE may cause adolescents to use moral disengagement mechanisms to try to explain their aggression against others by a longitudinal study. However, as the research-tested aggression, it is unclear whether the results can be generalized to aggressive traits (e.g. physical aggression and verbal aggression). Thus, we hypothesized that:

H1: Moral disengagement play the (partial) mediating role between VVGE and adolescent aggression.

1.3. Anger and hostility as potential mediators

Many studies have found that exposure to violent media may be associated with aggression emotions (e.g., anger and hostility) (Bushman, 2016; Hasan, Bègue, Scharkow, & Bushman, 2013); the levels of hostility and anger increase significantly in the short term after playing VVG, aggressive behavior becomes more likely (Yang, Huesmann & Bushman, 2014). VVGE for a long time will lead to hostility attribution bias and desensitization to hostility and anger generated by violence (Carnagey, Anderson & Bushman, 2007; Engelhardt et al., 2011). Adolescence is a critical period of brain development, some neurophysiological evidence showed that playing VVG caused lower activity in the right dorsolateral prefrontal cortex (DLPFC) (Hummer et al., 2010, 2019). It indicated how video game play may

impact brain function during inhibition (Hummer et al., 2014; Kronenberger et al., 2005) which may impair control of aggressive behavior. Adolescent prefrontal cortex development is not mature, plus the influence of VVG, resulting in weak emotional control ability, thus, anger, hostility and other negative emotions are important activation factors of aggression. Thus, we hypothesized that:

H2: Anger, hostility play the (partial) mediating role between VVGE and adolescent aggression.

1.4. Parental rearing patterns as potential moderators

The other important variable to be considered here is that of parental rearing patterns. Parental rearing patterns during early childhood have a huge impact on development (Olweus, 1994). Children who experience long-term abuse from parents in early childhood are more likely to behave with aggression in adulthood. Furthermore, parents in the education show anger, abusive and shoving aggression, after observation and imitation, then an increase in aggression is observed (Detert, Treviño, & Sweitzer, 2008). Negative behaviors shown by parents in daily life may lead to the increase of aggression of children and influence the mental health of adolescents (Dou et al., 2015; Guedes et al., 2018; Li, Li, & Zhang, 2016; Peltz, Rogge, & O'Connor, 2019).

Previous studies have found that positive parenting patterns can significantly reduce the levels of moral disengagement in adolescents and further reduce aggression (Pelton et al., 2004). The level of moral disengagement has been found to be highest with laissez-faire parenting patterns and lowest with authoritative parenting patterns (Liu & Lu, 2013). Different parenting styles are related to the amount of time spent on digital devices and playing video games. Among the contributing factors, parental punishment, rejection, denial, ignoring may lead to children using violent video games to reduce stress (Collier et al., 2016; Pressman, Owens, Evans, & Nemon, 2014; Sanders, Parent, Forehand, & Breslend, 2016). Based on the results of these studies, it can be speculated that parental rearing patterns play a very important moderating role between moral disengagement and aggression. However, there is little research and discussion on the role of parental rearing patterns, VVGE, moral disengagement, and aggression in adolescents. Therefore, we hypothesized that:

H3: Parental rearing patterns will moderate the relationship between VVGE, moral disengagement, and aggression.

2. Method

2.1. Participants and procedures

By adopting cluster sampling, a series of self-reported questionnaires were distributed to 737 adolescents from three high schools in Guangdong and Chongqing, China. Among these participants, 57 did not hand in their surveys, 19 did not complete surveys, and 31 answered the questions in the same response (means selecting the same number), which were excluded from the analysis. Thus, resulting in a final sample with 630 participants (valid response rate: 85.48%) consisting of 408 boys and 222 girls age from 12 to 20 years old ($M_{age} = 15.43$ years, $SD = 1.40$).

This study was approved by the Human Investigations Committee of Southwest University. Before the investigation, all the students, parents and teachers were told that the study was been conducted anonymously and that their information would remain confidential. Then, we obtained informed consent from the students and their parents. Subsequently, the trained research assistants introduced the guideline of the survey to the participants. All the participants were voluntary and they were free to withdraw from the study at any time.

2.2. Measures

2.2.1. Video Game Questionnaire (VQG)

To measure VVGE, we used the video game questionnaire adapted by Gentile et al. (2004) from Anderson and Dill (2000). Participants were asked to list their three favorite video games and record the frequency that they played each game on a 7-point Likert scale (1 = rarely, 7 = often). They then rated the violence extent of each game's content and graphics on a 7-point Likert scale (1 = little or no violence, 7 = extremely violent). The average rating of the three video games was used as the overall index of the VVGE. The index was calculated as: $\Sigma [(the\ content\ rating + the\ graphics\ rating) \times (the\ weekday\ frequency \times 5 + the\ weekend\ frequency \times 2)] \div the\ number\ of\ games$. And participants who never played video games were given a VVGE score of one (Yao et al., 2019). The higher the score, the higher the level of VVGE. In the present study, the Cronbach's α of the VQG scale was 0.90.

2.2.2. Buss-Perry Aggression Questionnaire (BPAQ, the Chinese version)

It consists of 29 items consisting of four dimensions: physical aggression, verbal aggression, anger, and hostility (Buss & Perry, 1992). All items use a 5-point scale (1 = strongly disagree, 5 = strongly agree). Higher total scores reflect higher aggression levels. In the present study, the Cronbach's α of the whole scale was 0.90.

2.2.3. Moral Disengagement Scale (MDS, the Chinese version)

It consists of 32 items and eight mechanisms: moral justification, euphemistic language, advantageous comparison, displacement of responsibility, diffusion of responsibility, distorting consequences, attribution of blame, and dehumanization. The Chinese version has been demonstrated to be a reliable and valid measurement (Yang & Wang, 2012). All items use a 5-point scale (1 = strongly disagree, 5 = strongly agree), and higher total scores reflect higher levels of moral disengagement. In the present study, the Cronbach's α of the whole scale was 0.90.

2.2.4. Egna Minnen av Barndomsnauppförstran (EMBU, the Chinese version)

The Egna Minnen av Barndomsnauppförstran was used to measure parental rearing patterns. The Chinese version has been demonstrated to be a reliable and valid measurement (Yue, 1993). The scale consists of 66 items and is rated by adolescents according to their past impressions about their father and mother separately on four levels: never, occasionally, often, and always. It is divided into six father-rearing patterns, including warmth and understanding (F1), punishment and severity (F2), over intervention (F3), preference (F4), denying (F5) and overprotection (F6), and five mother-rearing patterns which are warmth and understanding (M1), punishment and severity (M2), over intervention (M3), preference (M4), denying (M5). F1 and M1 are attributed to a positive parenting style whereas the others are negative. In the present study, the Cronbach's α of the scale was 0.95.

2.3. Data analysis

SPSS 25.0 was used to conduct statistical analysis. First, Harman single factor test (exploratory factor analysis, EFA) was used to test the common method bias. Second, descriptive statistics and Person correlation analysis of all variables were calculated. Third, we used the PROCESS macro (Hayes, 2013) for SPSS (Model 4) to examine the multiple mediating effects of moral disengagement, anger, and hostility on the relationship between VVGE and aggression, and further contrast the potential differences in direct effect among these three mediated variables (i.e. moral disengagement, anger, and hostility). Then, the PROCESS macro (Model 14) was applied to investigate the moderating role of parental rearing patterns in the relationship between moral disengagement and aggression. The Bootstrapping method was used to examine whether the mediating effects and moderating effects were

significant based on 5000 bootstrapping samples, and 95% bias-corrected confidence intervals (CI) did not contained zero indicated the effect was significant (Hayes, 2013).

3. Results

3.1. Test of common method bias

Common method bias refers to the artificial co-variation between the predicted variables and the criterion variables resulting from the same data source or raters, the same measurement environment, the project context and the characteristics of the project itself. Considering the data in our study relying on self-report of participants, artificial co-variation may exist; thus, the Harman single factor test was applied to exclude this bias. The result showed that there were 51 factors with eigenvalues greater than 1, with the largest single factor explaining 28.82% of the variance, which is less than the judgment standards of 40% (Podsakoff et al., 2003). Therefore, common method bias was not considered to be problematic in this study.

3.2. Correlation analyses

Table 1 shows the correlations between all the items with gender dummy coded (1 = male, 2 = female). VVGE was positively associated with moral disengagement, the four aggressive traits, and negative parental rearing style. Moral disengagement was positively associated with the four aggressive traits, and negative parenting style, and negatively associated with positive parenting style. Aggression and the four aggressive traits were positively associated with negative parenting style while negatively associated with positive parenting style. Gender, as a covariate in subsequent analyses, was positively associated with VVGE, moral disengagement and physical aggression.

3.3. Mediating role of moral disengagement, anger and hostility

In order to test the mediating role of moral disengagement in the relationship between VVGE and aggression we conducted PROCESS macro Model 4 using SPSS with 5000 bootstrapping samples. In this model, all data were standardized, VVGE was entered as the predictor, moral disengagement as a mediator, aggression as the outcome variable, and participants' gender was included as a covariate (see Table 2 and Fig. 1). The mediation effects of moral disengagement (0.05) was significant. After controlling for moral disengagement, the direct effect of VVGE on aggression was significant ($\beta = 0.19$, $SE = 0.04$, 95% $CI = [0.11, 0.26]$). Moral disengagement partially mediated the predictive effect of VVGE on aggression accounting for 23.66% of the total effect.

Second, VVGE was entered as the predictor, moral disengagement, anger and hostility as the mediators, physical aggression as the outcome variable, and participants' gender was included as a covariate. In this model, all data were standardized. The mediation effects of moral disengagement (0.02), anger (0.06) and hostility (0.02) were significant (see Table 3, Fig. 2). Moral disengagement, anger and hostility accounted for 8.06%, 23.09%, and 9.20% of the total effect respectively. When controlling for moral disengagement, anger and hostility, the direct effect of VVGE on physical aggression was significant ($\beta = 0.15$, $SE = 0.03$, 95% $CI = [0.08, 0.21]$). Moral disengagement, anger and hostility partially mediated the relationship between VVGE and physical aggression with 41.16% of the total effect.

Third, VVGE was entered as the predictor, moral disengagement, anger and hostility as the mediators, verbal aggression as the outcome variable, and participants' gender was included as a covariate. In this model, all data were standardized. The mediation effects of anger (0.03) and hostility (0.07) were significant (see Table 4, Fig. 3). Moral disengagement, anger and hostility accounted for 6.34%, 23.04%, and 48.21% of the total effect respectively. When controlling for moral

Table 1
Bivariate correlation and descriptive statistics for main variables.

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1 Violent video game exposure	78.76	82.50	1																		
2 Moral disengagement	61.90	17.35	0.16***	1																	
3 Physical aggression	18.43	5.74	0.29***	0.37***	1																
4 Verbal aggression	12.12	4.69	0.14***	0.27***	0.49***	1															
5 Anger	14.72	5.34	0.10***	0.26***	0.55***	0.45***	1														
6 Hostility	18.01	6.26	0.192***	0.36***	0.45***	0.50***	0.57***	1													
7. Aggression	63.27	17.46	0.23***	0.40***	0.79***	0.75***	0.81***	0.81***	1												
8 F1	48.50	11.53	-0.03	-0.15***	-0.10*	-0.05	-0.17***	-0.19***	-0.16***	1											
9 F2	19.91	6.90	0.18***	0.21***	0.26***	0.17***	0.29***	0.32***	0.33***	-0.30***	1										
10 F3	20.61	4.34	0.14***	0.09*	0.14***	0.18***	0.10*	0.21***	0.20***	0.20***	0.54***	1									
11 F4	10.17	3.51	0.15***	0.09*	0.14***	0.13***	0.04***	0.11***	0.13***	0.36***	0.08*	0.22***	1								
12 F5	10.40	3.61	0.16***	0.16***	0.22***	0.17***	0.22***	0.31***	0.30***	-0.25***	0.76***	0.59***	0.11***	1							
13 F6	10.67	2.93	0.18***	0.14***	0.18***	0.23***	0.16***	0.26***	0.26***	0.10*	0.53***	0.68***	0.27***	0.57***	1						
14 M1	51.01	12.19	-0.03	-0.14***	-0.08*	0.01	-0.13***	-0.14***	-0.11***	0.86***	-0.27***	0.19***	0.30***	-0.24***	0.07***	1					
15 M2	35.18	7.67	0.13***	0.11***	0.15***	0.23***	0.14***	0.30***	0.26***	0.13***	0.49***	0.75***	0.27***	0.57***	0.70***	0.18***	1				
16 M3	14.28	5.33	0.16***	0.19***	0.19***	0.18***	0.24***	0.37***	0.32***	-0.29***	0.70***	0.46***	0.12***	0.76***	0.51***	-0.32***	0.63***	1			
17 M4	14.35	5.29	0.15***	0.22***	0.21***	0.14***	0.26***	0.32***	0.30***	-0.28***	0.75***	0.38***	0.12***	0.64***	0.44***	-0.34***	0.52***	0.81***	1		
18 M5	10.93	3.02	0.10***	0.04***	0.13***	0.12***	0.05***	0.11***	0.13***	0.42***	0.12***	0.31***	0.82***	0.13***	0.27***	0.49***	0.34***	0.07***	0.05***	1	
19 Gender			-0.27***	-0.18***	-0.22***	-0.03	-0.07	-0.02	-0.05	-0.10*	-0.12***	-0.03	-0.01	-0.10*	80.07	0.11***	-0.01	-0.06	-0.07	0.01	1

Note: Gender (1 = male, 2 = female); Father-rearing patterns: warmth and understanding (F1), punishment and severity (F2), over intervention (F3), preference (F4), denying (F5) and over protection (F6), and mother-rearing patterns: warmth and understanding (M1), punishment and severity (M2), over intervention (M3), preference (M4), denying (M5).

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 2
Moral disengagement mediated the effects of VVGE on aggression.

Path	β	t	95% CI
a. Total effect model			
VVGE $\rightarrow$ aggression	0.24	5.86***	(0.16, 0.32)
Direct effects			
VVGE $\rightarrow$ aggression	0.19	5.03***	(0.12, 0.26)
VVGE $\rightarrow$ moral disengagement	0.12	3.07**	(0.04, 0.20)
moral disengagement $\rightarrow$ aggression	0.38	10.45***	(0.31, 0.46)
Indirect effects			
VVGE $\rightarrow$ moral disengagement $\rightarrow$ aggression	ab	SE	95% CI
	0.05	0.02	(0.02, 0.08)

Note: VVGE = Violent video games exposure, * $p < .05$, ** $p < .01$, *** $p < .001$. The same below.

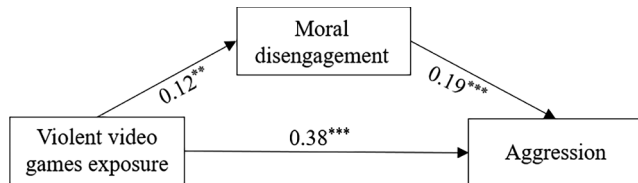


Fig. 1. The mediation effect of violent video games exposure on aggression.

disengagement, anger and hostility, the direct effect of VVGE on verbal aggression was not significant ($\beta = 0.03$, $SE = 0.04$, 95% $CI = [-0.04, 0.10]$). Anger and hostility fully mediated the relationship between VVGE and verbal aggression with 77.60% of the total effect.

3.4. Moderating effect of parental rearing patterns

In order to test the moderating role of parental rearing patterns, we conducted PROCESS macro Model 14 with parental rearing patterns as the moderators, gender as a covariate (Hayes, 2013). The results showed that the moderating effects of father's preference (F4) and mother's denying (M5) were significant in the relationship between moral disengagement and aggressive behavior (see Table 5, Fig. 4a, b). Simple slope tests suggested that in both levels of each pattern, moral disengagement had a significant positive predictive effect on aggression, which means that the patterns enhanced the influence of moral disengagement on aggression (supplemental Fig. 1). For F4: low F4 (-1 SD) individuals: $\beta = 0.33$, $SE = 0.05$, $t = 7.28$; high F4 ($+1$ SD) individuals: $\beta = 0.48$, $SE = 0.05$, $t = 8.83$. For M5: low M5 individuals: $\beta = 0.33$, $SE = 0.05$, $t = 7.05$; high M5 individuals: $\beta = 0.49$, $SE = 0.05$, $t = 9.15$ (all the $ps < 0.001$).

Table 3
The mediation effect of violent video games exposure on physical aggression.

Path	β	t	95% CI
a. Total effect model			
VVGE $\rightarrow$ physical aggression	0.25	6.32***	(0.17, 0.32)
b. Multiple mediation model			
Direct effects			
VVGE $\rightarrow$ physical aggression	0.15	4.58***	(0.08, 0.21)
VVGE $\rightarrow$ moral disengagement	0.12	3.07**	(0.04, 0.20)
VVGE $\rightarrow$ anger	0.13	3.20***	(0.05, 0.21)
VVGE $\rightarrow$ hostility	0.21	5.27***	(0.13, 0.29)
moral disengagement $\rightarrow$ physical aggression	0.16	4.88***	(0.10, 0.23)
anger $\rightarrow$ physical aggression	0.45	12.29***	(0.38, 0.52)
hostility $\rightarrow$ physical aggression	0.11	2.78**	(0.03, 0.18)
Indirect effects			
VVGE $\rightarrow$ moral disengagement $\rightarrow$ physical aggression	ab	SE	95% CI
	0.02	0.01	(0.01, 0.04)
VVGE $\rightarrow$ anger $\rightarrow$ physical aggression	0.06	0.02	(0.02, 0.10)
VVGE $\rightarrow$ hostility $\rightarrow$ physical aggression	0.02	0.01	(0.01, 0.04)

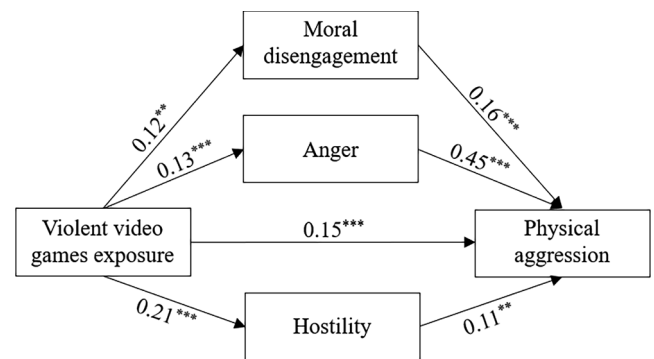


Fig. 2. The mediation effect of violent video games exposure on physical aggression.

Table 4
The mediation effect of violent video games exposure on verbal aggression.

Path	β	t	95% CI
a. Total effect model			
VVGE $\rightarrow$ verbal aggression	0.14	3.46***	(0.06, 0.22)
b. Multiple mediation model			
Direct effects			
VVGE $\rightarrow$ verbal aggression	0.03	0.89	(-0.04, 0.10)
VVGE $\rightarrow$ moral disengagement	0.12	3.07**	(0.04, 0.20)
VVGE $\rightarrow$ anger	0.13	3.20***	(0.05, 0.21)
VVGE $\rightarrow$ hostility	0.21	5.27***	(0.13, 0.29)
moral disengagement $\rightarrow$ verbal aggression	0.07	1.96	(-0.01, 0.15)
anger $\rightarrow$ verbal aggression	0.25	6.05***	(0.19, 0.33)
hostility $\rightarrow$ verbal aggression	0.32	7.44***	(0.23, 0.41)
Indirect effects			
VVGE $\rightarrow$ moral disengagement $\rightarrow$ verbal aggression	ab	SE	95% CI
	0.01	0.01	(0.01, 0.02)
VVGE $\rightarrow$ anger $\rightarrow$ verbal aggression	0.03	0.01	(0.01, 0.06)
VVGE $\rightarrow$ hostility $\rightarrow$ verbal aggression	0.07	0.02	(0.04, 0.11)

4. Discussion

4.1. Mediating role of moral disengagement

The results showed that VVGE significantly and positively associated with the occurrence of aggression. This is consistent with previous findings (e.g. Adachi & Willoughby, 2016; Anderson & Bushman, 2018; Teng, Liu, & Guo, 2015), further verifying the GAM. However, studies have shown that the relationship between VVGE and aggression is complex, and VVGE is not the only factor that influences aggression.

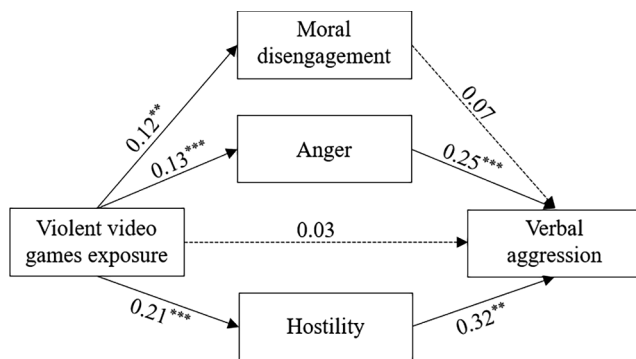


Fig. 3. The mediation effect of violent video games exposure on verbal aggression.

Table 5

The moderating effect of parental rearing patterns on the moral disengagement and aggression.

Path	β	t	95% CI
F1 $\times$ Moral disengagement $\rightarrow$ aggression	0.06	1.76	(-0.01, 0.13)
F2 $\times$ Moral disengagement $\rightarrow$ aggression	0.02	0.67	(-0.04, 0.07)
F3 $\times$ Moral disengagement $\rightarrow$ aggression	0.03	1.08	(-0.03, 0.10)
F4 $\times$ Moral disengagement $\rightarrow$ aggression	0.08	2.32*	(0.01, 0.15)
F5 $\times$ Moral disengagement $\rightarrow$ aggression	0.23	1.01	(-0.03, 0.09)
F6 $\times$ Moral disengagement $\rightarrow$ aggression	0.02	0.52	(-0.04, 0.08)
M1 $\times$ Moral disengagement $\rightarrow$ aggression	0.05	1.47	(-0.02, 0.11)
M2 $\times$ Moral disengagement $\rightarrow$ aggression	0.06	1.76	(-0.01, 0.12)
M3 $\times$ Moral disengagement $\rightarrow$ aggression	0.03	1.01	(-0.02, 0.09)
M4 $\times$ Moral disengagement $\rightarrow$ aggression	0.03	1.05	(-0.02, 0.08)
M5 $\times$ Moral disengagement $\rightarrow$ aggression	0.08	2.44*	(0.02, 0.15)

Note: only interactive items presented here to simplify results.

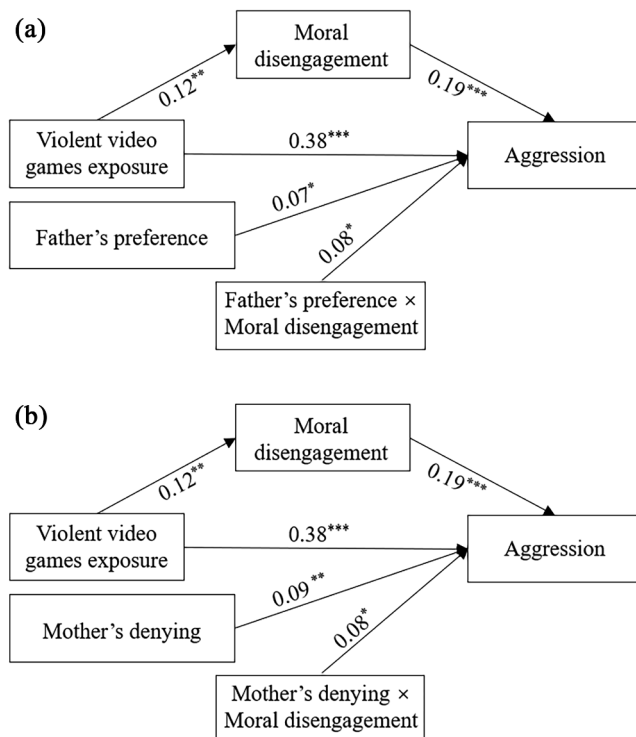


Fig. 4. The moderating effect of father's preference and mother's denying.

Consistent with H1, the results showed that moral disengagement mediated the effects of VVGE on aggression and physical aggression, suggesting that high level of VVGE is associated with increased moral disengagement in adolescent, which finally resulted in enhanced

aggressive behavior. This finding is consistent with previous research (Teng et al., 2019; Yao, Zhou, Li, & Gao, 2019). On the one hand, VVGE is an important factor increasing in the risk of higher levels of moral disengagement (Greitemeyer & McLatchie, 2011; Teng et al., 2017). On the other hand, moral disengagement is positively associated with aggression, especially with physical aggression not verbal aggression. Bandura's moral disengagement theory proposes when individuals demonstrate aggression, they tend to use is moral disengagement to avoid guilt and remorse (Bandura, 2002). Previous studies have found that there are two cognitive mechanisms for morality: the highest moral judgment mechanism and the most commonly used moral cognition mechanism. Individuals retain a lower moral thinking mode even after obtaining a higher moral judgment thinking mode and prefer the moral cognitive schemata that are in line with their own interests and habits (Derryberry & Thoma, 2005). Therefore, when facing immoral behaviors, in order to save cognitive resources, the most commonly used moral cognitive model is adopted in most cases. For example, individuals become more inclined to defend their physical aggressive behaviors and shirk their own responsibility in aggression (Fida et al., 2015).

4.2. Mediating role of anger and hostility

Consistent with H2, we found that anger and hostility played a partial mediating role between VVGE and physical aggression and a full mediating role between VVGE and verbal aggression, suggesting that high level of VVGE is associated with increased anger and hostility in adolescent, which finally resulted in enhanced aggressive behavior trait (i.e. physical aggression and verbal aggression). This is consistent with some previous studies (Adachi & Willoughby, 2016; Paciello et al., 2008). The results support the long-term effects of GAM (Anderson & Bushman, 2001), that individuals who have been in a violent environment for a long time gradually improve their levels of aggressive belief (Qian, Zhang, & Wang, 2013), repeated VVGE increase more stable aggressive traits (i.e. anger and hostility), which leads to individual desensitization to violent behaviors. When aggressive behaviors occur, the sensitivity of individual responses decreases or even disappears, which is reflected at the cognitive level, namely, aggressive traits. Individuals are more inclined to believe that violence is understandable, frequent, and inevitable, which enhances of aggressive personality. Finally, it will influence individuals' decision together with situational variables and lead to an increase in physical aggression in the longer-term (DeWall, Anderson, & Bushman, 2011). However, one interesting finding, VVGE is not directly associated with verbal aggression, it is wholly mediated through hostility and anger. For example, the hostility and anger generated by the bad experience playing a video game may lead to uncivilized and bad language.

4.3. Moderating effect of parental rearing patterns

Consistent with H3, our study found that the moderation role of father's preference and mother's denying, two dimensions of parental rearing patterns, between moral disengagement and aggression was significant. Father's preference and mother's denying with mediators can positively predict aggression. First, fathers' preference may create an environment that is spoiled and over-protected, leading to children being capricious, self-centered, and unable to form a positive self-concept (Shao & Li-Ping, 2011; Guedes et al., 2018). When an adolescent demonstrates an unexpected behavior, such as aggression, the child may reflexively come to think that "it is not my own fault", attribute the reason to others or other external factors in order to remove from the matter, increasing the probability of unethical behavior. Second, the parenting style of the mother is critical to the development of the adolescent (Liu & Lu, 2013). In particular, the experience of denial, rejection, and excessive severity may help the development of an aggressive cognitive model in adolescent (Dou et al., 2015), among these

factors, mother's denying provides a negative influence to children. Moreover, teenagers' self-consciousness is constantly developing, they are eager for independence and freedom, and they no longer blindly follow authority and various social norms as they have in the past (Li, Li, & Zhang, 2016). The development of this social cognitive ability is one of the reasons why moral disengagement and aggressive behavior occurs. Therefore, parents should pay attention towards providing children with moderate levels of emotional support and care, so as to develop the better parent-child relationship.

4.4. Limitations

This study has some limitations that should be noted and taken into account for future research. There may be response bias in self-reporting, although we took some measures to reduce the worries of adolescents, such as giving participants clear instructions, telling them that there is no right or wrong answer to the questions, and emphasize the confidentiality of the results. Future research can use experimental methods to measure variables, or include third-party evaluations from parents, schools, and classmates. Another important aspect is the generalizability of the Chinese sample. There are significant differences in parenting styles between Chinese and Western cultures, future replications with cross-cultural studies are recommended. Finally, this cross-sectional study cannot explain the causal relationship between VVGE and aggression, while exploration of longitudinal study can be possible in the future.

5. Conclusion

In general, this study enriches the research on aggression by analyzing the relationship between VVGE and aggression in Chinese adolescents. The findings suggest that VVGE was positively associated with moral disengagement and adolescent aggression. First, moral disengagement played a partial mediating role between VVGE and adolescent aggression; anger and hostility played a partial mediating role between VVGE and physical aggression and a full mediating role between VVGE and verbal aggression. Second, father's preference and mother's denying of the parental rearing patterns moderated the relationship of moral disengagement and aggression. The findings suggest that moral disengagement, anger, hostility and parental rearing patterns may be the factors that increase in the risk of higher levels of adolescent aggression after repeated exposure violent video games.

Compliance with Ethical Standards

Ethical Approval

The Human Investigations Committee of Southwest University approved this research. And the group tests were prior to the consent of students, parents and teachers.

CRedit authorship contribution statement

JiaYu Li: Conceptualization, Investigation, Methodology, Data curation, Writing - original draft, Writing - review & editing. **Qian Du:** Investigation, Methodology, Writing - original draft. **Xuemei Gao:** Conceptualization, Funding acquisition, Writing - original draft, Writing - review & editing.

Declaration of Competing Interest

This research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. Author L declares that she has no conflict of interest. Author D

declares that she has no conflict of interest. Author G declares that she has no conflict of interest.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.childyouth.2020.105370>.

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