

# Does Aggressive Trait Induce Implicit Aggression among College Students? Priming Effect of Violent Stimuli and Aggressive Words

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## Abstract

The purpose of the study was to examine the priming effect of exposure to violent pictures on implicit aggression in a sample of 94 Chinese college students, and to verify the validity of General Aggression Model (GAM) and Cognitive New-association Model (CNM). Violent and nonviolent pictures, as well as aggressive and nonaggressive words, were used as primes to explore the relationship between violent stimuli and implicit aggression of college students by employing modified Go-NoGo task. The results suggested that the priming effect of exposure to violent pictures on participants was obvious, and that brief exposure to violent pictures increased implicit aggression. Repeated measures analysis of variance (ANOVA) found that interaction between stimuli type (violent vs. nonviolent) and target word (aggressive vs. nonaggressive) was significant, implying that violent stimuli primed implicit aggression among college students. Further simple effect analysis showed that implicit aggression was significantly primed by violent stimuli for participants with high aggressiveness (HA) and moderate aggressiveness (MA), but not for participants with low aggressiveness (LA). This result should be cautiously explained that only implicit aggression of college students with HA and MA was significantly primed by violent stimuli.

**Keywords:** aggressive trait, implicit aggression, college students, violent stimuli, aggressive words

## 1. Introduction

Research on violence and aggressive behavior was the focus of psychology at home and abroad. The issue concerning effects of violent stimuli on aggression once aroused intensely debates among scholars and general public through the years. Prior researchers mainly defined aggression from three perspectives: cognitive process, explicit emotion and behavioral performance. For instance, Dodge et al. assumed aggression was determined by the cognitive processing in human mind (Coie, Dodge, Terry & Wright, 1991). Allen et al. thought aggression was the explicit expression of anger (Allen & Potkay, 1981). Buss et al. contended aggression was an intentional behavior which caused harm to others, meanwhile the targets attempted to escape (Buss, 1961; Berkowitz & Leonard, 1965; Baron & Richardson, 2004; Anderson & Bushman, 2001; Pan, 2005). More importantly, experts claimed that implicit aggression (e.g., hostile cognition) shaped aggressive responses to society (DeWall, Twenge, Gitter, & Baumeister, 2009; Bushman & Huesmann, 2010). Obviously, aggression could cause psychological and physiological hurt to others, and cognition, personality and emotion may lead to aggressiveness. Based on this, we concluded implicit aggression was a kind of aggression to injure others by violating social norms and standards, including aggressive cognition, thinking and affect.

A few years ago, a great many shooting case was happened worldwide, such as the shooting incidents on campus of Virginia University in the U.S, which brought potential dangers to college students and teachers. Meanwhile, researchers found many youngsters who committed crimes were affected by violent scenes, and thus imitating antisocial behaviors (Haejung & George, 1994). According to GAM, short-term exposure to violent media would activate viewer's aggression, and long-term exposure would affect viewer's aggressive personality (DeWall, Anderson, & Bushman, 2011). Additionally, accumulating evidence indicated prolonged exposure to violent TV

programming during childhood was associated with subsequent aggression (Anderson & Bushman, 2002). Experts found exposure to firearm violence approximately doubled the probability that adolescents would perpetrate serious violence over the subsequent 2 years (Bingenheimer, Brennan, & Earls, 2005). Anderson et al. once explored the effects of weapon pictures on college students' hostile cognition, emotion and physiological arousal. The results revealed that weapon pictures impacted aggressive cognition, but not significantly impacted hostile emotion and physiological arousal (Anderson, Anderson, & Deuser, 1996). Anderson et al. investigated the automatic priming effects of weapon pictures and names on aggression. Researchers used words (weapons and animals) and pictures (weapons and botanies) as the priming stimuli, making subjects react to target stimuli (aggressive words vs. nonaggressive words) as quickly and accurately as possible by employing word-naming task. The results demonstrated that weapon words had larger priming effects than weapon pictures on aggression, but no significant difference was found (Anderson, Benjamin Jr, & Bartholow, 1998). Bartholow et al. found the priming effect was different due to different firearm knowledge structure, and that shotgun could prime non-hunter's aggression, and firearm aiming to personal injury could prime the hunter's aggression (Bartholow et al, 2005). Some other researches demonstrated significant effect of community and contextual violence exposure on mental health among youth (Mitchell et al., 2010). Some scholars, nevertheless, was still suspicious about these conclusions, for they concluded violent stimuli may not cause aggressive behavior, and no evidence assured viewing violent stimuli in natural settings increased subsequent aggressiveness (Wellford, Pepper, & Petrie, Freeman, 1984; 2007; Holden, 2005).

Currently, China was undergoing social transition and transformation at a fast rate, fighting, pornographic pictures and violent screen might have negative effects on implicit aggression among college students, and consequently leading some of them to do illegal things, such as Jiajue Ma murder, Jiaxin Yao killings, and Haiyang Liu bear-injury incident, and so forth. Recently, the effects of violent stimuli on aggression among Chinese college students have gradually drawn attention from officials, scholars, and public staffs. It was not clear, however, how violent stimuli could impact aggression among Chinese college students. Meanwhile, existing research did have some shortcomings: First, current literature lacked research data about aggression in Mainland China, especially in sample of college students. Second, previous research only investigated the impact of situational variables (e.g., weapon pictures) on aggression, not paid attention to individual variables (e.g., aggressive trait). According to GAM, both situational factors and personality factors affect aggressive cognition, affect and physiological arousal for individuals. Third, prior researchers discussed the aggressive differences between high aggressiveness (HA) and low aggressiveness (LA), not touching the subjects who were moderate aggressiveness (MA). Last, culture was closely associated with aggressive research (Browne & Giachritsis, 2005; Ramirez, Andreu, & Fujihara, 2001). Some researchers even criticized the generalization of relationship between media violence and aggression from one country to another country because this connection may be different (Ferguson & John, 2010). Under these circumstances, applicability of aggressive research in different cultures should be considered, in order to effectively intervene in aggressive behavior among college students in China.

The present study was to examine the priming effects of violent stimuli on implicit aggression among Chinese college students by employing Go-Nogo task with two goals: (a) to verify the possible relationship between violent stimuli and implicit aggression; (b) to examine whether participants with different aggressive traits had different aggression primed by violent pictures. Therefore, two hypotheses were proposed as follows,

**Hypothesis 1.** Violent stimuli may effectively prime implicit aggression among Chinese college students.

**Hypothesis 2.** Implicit aggression of college students in HA was significantly higher than those with MA and LA.

## 2. Method

### 2.1 Participants

94 Chinese college students (47 boys, 47 girls) were randomly selected from Southwest University in China. Participants ranged in age from 18 to 24 years ( $M = 22.64$ ,  $SD = 1.61$ ). Approximately 71% were from urban areas while 29% were from rural areas. Approximately 86% were Han majority, 8% were Tujia minority and 6% were Miao minority. These demographics represented the student population at this university. Surveys were distributed in three classes, each containing approximately 30 students. They were right-handed, no color blindness, without any physical and mental disorder. After obtaining informed consent, college students who volunteered to participate were given 45 min to complete the questionnaire. After experiment, each participant was given a certain reward. The formal participants were shown in table 1.

Table 1. Descriptive data for experiment by gender and aggressive trait in the study

Gender	Aggressive Trait			Overall
	HA	MA	LA	
Boys	13	21	13	47
Girls	12	20	15	47
Overall	25	41	28	94

Description: HA=high aggressiveness; MA=moderate aggressiveness; LA=low aggressiveness.

## 2.2 Materials

### 2.1.1 Computer

The computer resolution was 1366 × 768, and the refresh rate was 60Hz. The distance between the participants and the screen was about 60cm. The faces of the participants were parallel with the computer screen, and the eyes were kept at the same level with the screen center.

### 2.2.2 Stimuli

A total of 36 colorful pictures, including 18 violent and 18 nonviolent pictures, were used as primed stimuli. Violent pictures included weapon pictures (gun, knife, etc.), and nonviolent pictures consisted of animals and plants. The size of 36 pictures was same. For violent pictures, the background color was white, and the violent pattern was in the screen center, no other screen content was included. For nonviolent pictures, the background color was also white, and the nonviolent pattern was in the screen center, and no other screen content was included. 32 pictures (16 violent pictures, 16 nonviolent pictures) were used for formal experiment, 4 pictures (2 violent pictures, nonviolence pictures) were used in practical session.

### 2.2.3 Target Words

Aggressive and nonaggressive words were used as target words. According to Modern Chinese Word Frequency Dictionary, 60 aggressive and 60 nonaggressive words in similar frequency were selected from the previous studies (e.g., Anderson et al, 1996; 1998). 60 college students (30 boys, 30 girls) were allowed to choose 25 aggressive and nonaggressive words according to the following requirements: 1) The familiarity of words selection; 2) Aggressive degree of words selection (see Table 2 and table 3).

Table 2. Target words in practical session of the experiment

Aggressive words (n=5)		Nonaggressive words (n=5)	
assault	hurt	abort	loan
overthrow	bullying	suggest	introduce
boxing		review	

Table 3. Target words in formal session of the experiment

Aggressive words (n=25)			Nonaggressive words (n=25)		
attack	battle	beat	blossom	borrow	change
collide	destroy	destruct	chat	describe	develop
distress	fight	injure	discuss	import	improve
insult	kill	molest	investigate	laugh	leave
murder	pinch	punch	listen	miss	organize
revenge	shoot	slaughter	read	recite	relax
stab	strangle	strike	report	observe	rejoice
torture	threaten	wound	sing	talk	think
wreck			watch		

## 2.2.4 Measures

Buss-Perry Aggression Questionnaire (BPAQ), a 5 point evaluation scale, was commonly used to measure aggressive trait for participants. It included four dimensions: physical aggression (PA), language aggression (VA), anger (A), and Hostility (H). The scale contained a total of 29 questions, of which 9 and 16 questions were the reversing scores (Buss & Perry, 1992). The scale had good internal consistency reliability (consistency between physical aggression and the total score was 0.85, language aggression was 0.72, anger was 0.83, hostility was 0.77, and the total coefficient of Crobach-alpha was 0.89), and the test-retest reliability (the test-retest consistency of total scale and the subscales were between 0.75 and 0.85 after 8 weeks, and the reliability coefficient was 0.89). It has a good reliability and validity (Wang et al., 2012). Participants' reaction to each item was evaluated by Likert 5 point scale method, 1 represented "not conform to", 5 represented "very in line with". Choosing "1" recorded 1 point, and choosing "5" represented 5 points, and so forth.

## 2.3 Research Design

2 (Picture Type: violent vs. nonviolent)  $\times$  2 (Target Word: aggressive vs. nonaggressive)  $\times$  2 (Gender: boys vs. girls)  $\times$  3 (Aggressive Trait: HA, MA, LA) four repeated measures analysis of variance was conducted to examine the main effect and interaction of reaction time (RT), with gender and aggressive trait as between-subject factors, and picture type and target word as within subject factors. According to score distribution of Buss-Perry Aggression Questionnaire (BPAQ), the first top of 27% was defined as HA group, the last 27% was defined as LA group, and the rest were MA group. The male and female subjects in each group were proportionally balanced. The independent variables were gender and aggressiveness, and the dependent variable was the RT to target words. All participants were treated according to the ethical guidelines of the *American Psychological Association* (American Psychological Association, 1972).

## 2.4 Procedure

The procedure was programmed by E-prime psychology software, and it was divided into two stages: practical session and formal session. Each participant finished the experiment one by one. First, sign an informed consent, which told the subject contents and important matters in the experiment. Second, participants were required to complete BPAQ. Third, complete Go-Gogo task. Last, participants were debriefed aggressive feelings, and they obtained nice gifts after the experiment. Specifically, the procedure was programmed by E-Prime psychology software, and the program was divided into 2 stages: practice and formal sessions. A black sign "+" appeared in the screen center for 300ms to remind participants to prepare, and then pictures were presented in the computer screen for 1000ms. After that, Goal words would be presented in the screen, subjects were asked to respond to react as quickly and accurately as possible by making key-press reaction in keyboard within 1000ms. If participants did not respond within 1000ms, the next trial will automatically appear in the screen. The inter-stimulus-interval (ISI) was 200-300ms, and the RT and accuracy rate were automatically recorded by the computer system. The goal words were 72 black fonts. The instructions were: "The experiment is to test the speed and accuracy of your reaction, the picture is first to be presented in the screen center, and then the words are presented, please judge whether the words are aggressive or nonaggressive. If the aggressive word (Go stimulus) appears, you should press "J"; if the nonaggressive word (Nogo stimulus) appears, you should press "F". After you react, the next trial begins." The simplified procedure could be seen in figure 1.

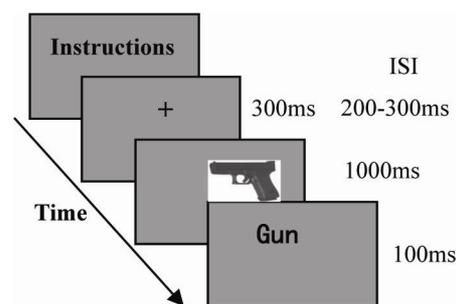


Figure 1. Modified Go-Nogo task procedure

#### 2.4.1 Practical Session

2 nonviolent pictures (1 animal, 1 plant), 2 violent pictures (1 gun, 1 knife) and 10 words (5 aggressive words, 5 nonaggressive words) were paired, forming totally 20 trials. The pictures used in practical session were not presented in formal session. In practical process, instructor watched beside the participant, preparing to answer problems participants raised. If the accuracy rate of participants in practice session was less than 85%, then the program got back to the practice session. Only the accuracy rate was higher than 85%, could the program automatically get into the formal session. The purpose was to make participants be familiar with the experimental procedure.

#### 2.4.2 Formal Session

16 nonviolent pictures (8 animals, 8 plants), 16 violent pictures (8 guns, 8 knives) and 50 words (25 aggressive words, 25 nonaggressive words) were paired, and forming totally 200 trials, which were divided into 2 blocks. Every block contains 100 trials. Pictures and words were randomly appeared on computer screen in matching forms. Participants could have a proper rest between blocks. Participants should press “F” on keyboard when aggressive word appeared and pressing “F” when nonaggressive word was presented. The left- and right hand keypressing responses were counterbalanced among the participants.

### 3. Results

#### 3.1 Priming Effects of Picture Types on Implicit Aggression

We assumed shorter reaction time to aggressive words than to nonaggressive words in Go-Nogo task when violent pictures were primed. To better examine the cognitive priming effect of violent pictures, we set aggressively activated score (AAS) to reflect the automatic priming effect of violent pictures and aggressive words. Above all, we verify whether significant differences between the score and zero. In other words, the RT to aggressive words was subtracted from the RT from nonaggressive words, and the difference implied the aggressively activated degree. Table 4 showed the average RT and mean AAS of participants to aggressive words when priming stimuli were violent and non violent pictures.

Table 4. Mean reaction time (milliseconds) to aggressive and nonaggressive words in the experiment

Primes	Target Words				Mean Aggressively Activated Score (AAS)
	Aggressive Words		Nonaggressive Words		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Violent Pictures	506	78.25	521	81.33	+15
Nonviolent Pictures	519	70.98	516	74.25	-3
Priming Effect of Violent Picture					+18

Description: Priming effect of violent pictures= mean aggressively activated score (AAS) under the condition of violent picture primes minus AAS under the condition of nonviolent picture primes.

As shown in Table 4, participants reacted faster to aggressive words than to nonaggressive words for 15ms under the circumstances of violent picture primes, whereas participants reacted slower to aggressive words than to nonaggressive words for 3ms under the condition of nonviolent picture primes. Thus, 18ms (15ms+3ms) was the priming effect of violent pictures.

#### 3.2 Multivariate Analysis of Covariance (MANCOVA) between Picture Type and Target Word

Table 4 showed that the priming effect of violent picture was 18ms. To figure out whether the significant differences between the AAS and zero, further picture type and target word interaction analysis should be conducted. If the interaction was significant, demonstrating violent picture primed the participants' implicit aggression. Multivariate repeated-measures analysis of variance was carried out to investigate the interaction, and the results could be seen in Table 5.

Table 5. Multivariate analysis of variance (MANCOVA) between picture type and target word

Primes	<i>M</i>	<i>SD</i>	<i>F</i>
Picture Type	328	51.38	0.18
Target Word	1624	195.44	0.61
Violent Picture×Target Word	2877	422.57	6.96*

Description: \*  $P < 0.05$ , \*\*  $P < 0.01$ , \*\*\*  $P < 0.001$ .

As could be seen in Table 5, the main priming effect of picture type was not significant ( $F=0.18$ ,  $P > 0.05$ ), which meant that the RT of participants to target words was not significant under the condition of violent and nonviolent picture primes. Additionally, the main effect of target word was not significant, which referred to the RT of participants to aggressive and nonaggressive words were not significant ( $F=0.61$ ,  $P > 0.05$ ). However, there was significant Picture Type × Target Word interaction ( $F=6.96$ ,  $P < 0.05$ ), explaining participants' implicit aggression was primed by picture type. Further simple effect analysis showed that the RT of participants to aggressive words ( $M=606$ ,  $SD=82.57$ ) was significantly different from the RT to nonaggressive words ( $M=618$ ,  $SD=94.46$ ) under the condition of violent picture primes ( $F=3.52$ ,  $P < 0.05$ ). No significant difference ( $F=0.09$ ,  $P > 0.05$ ), nonetheless, was found between the RT of participants to aggressive words ( $M=615$ ,  $SD=74.52$ ) and nonaggressive words ( $M=613$ ,  $SD=74.31$ ) (see Table 6).

Table 6. RT differences to target words under the condition of violent and nonviolent pictures

Primes	Target words				<i>F</i>
	Aggressive Words		Nonaggressive Words		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Violent Picture	557	80.48	628	94.77	3.38*
Nonviolent Picture	635	76.32	613	92.81	0.86

Description: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

### 3.3 Priming Effects of Violent Pictures on Implicit Aggression among Participants with Differing Aggressive Traits

Three kinds of aggressive traits of participants who viewed both violent and nonviolent pictures would be analyzed with regard to their cognitive priming effect. The mean RT of participants with HA to aggressive words ( $M=512$ ) was shorter than to nonaggressive words ( $M=537$ ) under the condition of violent picture primes, and the mean aggressively activated score (AAS) was 25ms. On the other hand, the mean RT of participants with HA to aggressive words ( $M=612$ ) was a bit longer than to nonaggressive words ( $M=589$ ) under the condition of nonviolent picture primes, and the mean AAS was -32ms. As a result, the priming effect of violent picture was 57ms (25ms+32ms). The priming effect of participants with HA was significant under the condition of violent pictures ( $F=1.98$ ,  $P < 0.05$ ), whereas the priming effect of participants with HA was not significant under the condition of nonviolent pictures ( $F=0.86$ ,  $P > 0.05$ ) (see Table 7).

Table 7. Post hoc between picture type and target word in participants with HA

Primes	Target Word				Mean AAS	<i>F</i>
	Aggressive Word		Nonaggressive Word			
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Violent Picture	512	80.48	537	94.77	25ms	3.38**
Nonviolent Picture	612	76.32	589	92.81	-32ms	0.86
Priming Effect of Violent Picture					57ms	1.98*

Description: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

The mean RT of participants with MA to aggressive words ( $M=541$ ) was shorter than to nonaggressive words ( $M=598$ ) under the condition of violent picture primes, and the mean AAS was 57ms. The mean RT of participants with MA to aggressive words ( $M=633$ ) was longer than to nonaggressive words ( $M=574$ ) under the condition of nonviolent picture primes, and the mean AAS was -59ms. Hence, the priming effect of violent picture was 116ms ( $57\text{ms}+59\text{ms}$ ), and significant priming effect of violent picture was found ( $F=6.54, P<0.05$ ), explaining implicit aggression of participants with MA was significantly primed by violent pictures (see Table 8).

Table 8. Post hoc between picture type and target word in participants with MA

Primes	Target Word				Mean AAS	F
	Aggressive Word		Nonaggressive Word			
	M	SD	M	SD		
Violent Picture	541	83.66	598	86.89	57ms	2.87**
Nonviolent Picture	633	87.01	574	90.25	-59ms	0.75
Priming Effect of Violent Picture					116ms	6.54*

Description: \*  $P<0.05$ , \*\*  $P<0.01$ , \*\*\*  $P<0.001$ .

The mean RT of participants with LA to aggressive words ( $M=587$ ) was shorter than to nonaggressive words ( $M=596$ ) under the condition of violent picture primes, and the mean AAS was 9ms. The mean RT of participants with LA to aggressive words ( $M=579$ ) was shorter than to nonaggressive words ( $M=590$ ) under the condition of nonviolent picture primes, and the mean AAS was 11ms. Hence, the priming effect of violent picture was 46ms ( $57\text{ms}-11\text{ms}$ ), and no significant priming effect of violent picture was found ( $F=0.58, P>0.05$ ), explaining implicit aggression of participants with LA was not significantly primed by violent and nonviolent pictures (see Table 9).

Table 9. Post hoc between picture type and target word in participants with LA

Primes	Target Word				Mean AAS	F
	Aggressive Word		Nonaggressive Word			
	M	SD	M	SD		
Violent Picture	587	82.95	596	86.71	57ms	2.96
Nonviolent Picture	579	81.52	590	91.27	11ms	0.65
Priming Effect of Violent Picture					46ms	0.58

Description: \*  $P<0.05$ , \*\*  $P<0.01$ , \*\*\*  $P<0.001$ .

#### 4. Discussion

Prior research found that it was easy to form aggressively cognitive schema if someone exposed to media violence for a long time, and the aggressive schema stored in brain was easily to be activated by related stimuli, and thus affecting the cognitive processing of information (Huesmann, 1988). In our points of view, participants appeared lots of attention and cognitive processing on aggressive information because their aggressive schema could be easily activated by violent pictures. For instance, scholars argued that weapons were closely linked to aggression and hostile concepts from semantic memory according to CNM. These aggressive or hostile concepts were easily activated, and thus primed individuals' implicit aggression when they saw weapons (Berkowitz & Leonard, 2003). In this sense, experts vividly claimed that the picture of guns may help aggressive individuals pull the trigger (Anderson, 1998). According to GAM, input variables (e.g., weapon pictures) and individual variables (e.g., aggressiveness, gender) could affect individuals' inner mental states, including cognition, emotion and behavior. What's more, repeated exposure to violence may form certain aggressively cognitive schema, and lead to cultivate aggressive personality. Therefore, we combined situational variables with personality factors to examine the priming effect of violent pictures on college students' implicit aggression.

Based on the long-term process of GAM, we could predict possible long-term effect of violence in terms of violent materials.

The violent stimuli selected in the study were violent pictures, which was a kind of simple visual materials with weapons, so it was just a semantic priming stimulus. On the whole, the study demonstrated that implicit aggression of college students was primed by violent pictures by employing Go-Nogo task, partly supporting the validation of GAM and CNM to some extent (Bushman, 1996; Bushman & Anderson, 2002). Anderson et al. found viewer's aggressive thoughts, feelings, attitudes and behaviors could be primed by weapons pictures and word naming through STROOP color naming and word naming task (Anderson, Anderson, & Deuser, 1996; Anderson, Benjamin & Bartholow, 1998). The study gave full consideration to the function of situational factors (picture type) and individual variables (aggressiveness) when examining the priming effect of violent pictures, which was different from previous research. Individuals' cognitive structure of aggression could be strengthened if they exposed to excessive violent stimuli too much. Hence, individuals' aggressive personality was shaped, and that aggressive traits may further produce cognitive bias of social information and thus aggressive behavior was arisen. In particular, the significant priming effect of violent picture was found in both participants with HA and MA, but not in LA. This result was in line with previous researches, which showed that the moderately aggressive and highly aggressive boys differed from the nonaggressive boys on attributional biases, and that severely aggressive displayed more social-cognitive dysfunctions than moderately and lowly aggressive boys (Bushman, 1995; Anderson, 1997; Lochman & Dodge, 1994; Widom, 1989; Virkkunen, Kallio, & Rawlings, 1994; Anderson, Anderson, Dill, & Deuser, 1998; Craig, Browne, Beech, & Stringer, 2006). Moreover, the result was in agreement with prior researches, and were also correspondent with the expected hypotheses, which assumed that individuals with HA had higher aggression than others (Bushman, 1996). Therefore, the results told us not implicit aggression of all college students was primed by violent stimuli, but only for college students with HA and BA. This result should be interpreted cautiously. However, the question we'd like to mention was the mechanisms underlying these phenomena, perhaps the cognitive schema of individuals with HA may have stronger aggressively associated network than others with MA and LA, and their aggression was more likely to be activated by the same violent stimuli. The results indicated personality traits were associated with aggressiveness, and that personality factor was becoming an influential variable of aggression to verify the correction of GAM, which replicated related studies (Anderson, Buckley, & Carnagey, 2008). In addition, neuroimaging studies revealed the underlying brain mechanism of frontal and prefrontal cortex may be related to individuals' violence and crime (Price & Brower, 2001; Jana & Vickie, 2005).

There were some differences and similarities between this study and previous research. Previous research paid more attention to the effect of situational variables (weapon pictures) on aggression by using STROOP task rather than considered situational and individual interaction. The present study made up for the lacking, and showed aggression was primed by violent pictures especially for participants with HA and BA, which was in agreement with previous studies (Anderson et al, 1998). The violent pictures would activate implicit aggression, and would affect interpretation, evaluation and decision-making process of information from cognitive psychology perspective. The violent stimuli may even make us give aggressive interpretation of information under the circumstances of external ambiguous information; Individuals may increase aggressive behavior when they were provoked (compared with no priming situation). Regular exposure to violent stimuli would make cognitive process of viewers be biased, and increase the possibility of implementing aggressive behavior. Despite the priming aggression may quickly erase in a short time, but it may be activated by context clues again in a subsequent situation.

## 5. Limitations

This study may be one of the first to explore the priming effects of violent pictures on implicit aggression among college students with differing aggressive traits in China. Despite these strengths, the results of this study should be viewed in light of some limitations. First, the sample in the study was relatively small and included a homogeneous group of students at Southwest University in Chongqing municipality. As such, generalizations of our findings should be made cautiously. Second, a cross-section design was used in this study, which prevented the determination of causal relationships. Third, the violent pictures consisted of knives and guns. In reality, we found boys may take interest in firearm pictures, whereas girls may not be interested. Therefore, consideration should also be given to which weapon pictures in the eyes of girls when selecting violent stimuli. In the future study, researchers should also consider using a qualitative approach aimed at complementing survey data to better understand the associations between violent pictures, implicit aggression and aggressive traits. More importantly, longitudinal studies should be conducted to provide stronger evidence of causal relations among variables explored in this study.

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