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Aggressive behaviors in highly sadistic and highly impulsive individuals

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ARTICLE INFO

Keywords:

Sadistic traits
Impulsive traits
Proactive aggression
Reactive aggression

ABSTRACT

Sadism is tightly linked with aggressive behaviors against others, akin to impulsivity. However, whether the aggressive behaviors predicted by sadism and impulsivity differ remains unknown. In this work, self-reported scales were used in Study 1 ($N = 1183$, 579 males) with correlation analyses, while Studies 2 and 3 utilized the Taylor aggression paradigm and compared reactive/proactive aggression across three groups of individuals: those with highly sadistic traits but an average level of impulsivity ($N = 30$, 15 males), those with high impulsivity but an average level of sadism ($N = 30$, 15 males), and those with both low sadism and low impulsivity (i.e., control group; $N = 30$, 15 males). Results showed that sadism was more strongly correlated with proactive aggression than was impulsivity and that impulsivity was more strongly related to reactive aggression than was sadism. Furthermore, provocation led to more reactive aggression in highly impulsive individuals than in the control group, and highly sadistic individuals showed more proactive aggression than did the control group. The dominance analysis revealed that impulsivity drives reactive aggression over and above sadism, but proactive aggression is mainly driven by sadism. Hence, sadistic and impulsive traits are relatively associated with different types of aggression.

1. Introduction

As human beings, we enjoy prosocial activities (House et al., 2013). However, some people exhibit sadism, and an individual with this trait has the tendency to obtain pleasure from the suffering of others. Rather than passively taking enjoyment from others' pain, sadists actively harm others (Buckels, Jones, & Paulhus, 2013; Davies & O'Meara, 2007; Reidy, Zeichner, & Seibert, 2011). Previous studies have found that sadism is related to various types of antisocial behaviors, such as campus bullying (Twemlow & Sacco, 2013), child abuse (Buckels, 2012), sexual abuse (Fedoroff, 2008; Holt & Strack, 1999; Reidy et al., 2011), and sexual homicide (Chopin & Beauregard, 2020; Darjee, 2019; DeLisi et al., 2017). These findings mean that sadistic individuals show aggression against others, which is characterized by impulsivity (Anderson & Bushman, 2002). Although both traits predict aggressive behaviors, it remains to be seen whether the aggressive behaviors predicted by sadism and impulsivity differ. Answering this question will help us clarify the relationship between sadistic and impulsive traits and will be beneficial for preventing the occurrence of different aggressive behaviors (such as school bullying) in real life.

1.1. Concept and measurement of sadism

Early quantitative investigations and observations indicated that sadistic behaviors are common in clinical populations (Davies & O'Meara, 2007; Kirsch & Becker, 2007) and criminals (Chopin & Beauregard, 2020; Darjee, 2019; DeLisi et al., 2017; Dietz, Hazelwood, & Warren, 1990; Holt & Strack, 1999; Stone, 1998; Warren, Hazelwood, & Dietz, 1996). Therefore, the American Psychiatric Association defined sadism as a form of personality disorder (American Psychiatric Association, 1987) at that time. Millon, Grossman, Millon, Meagher, and Ramnath (2004) argued that sadism, for which the manifestations are controlling and abusing others by cruel, insulting, aggressive behavior, is a type of maladaptive behavior.

However, some researchers have indicated that sadism also appears in nonclinical populations, who obtain pleasure from hurting others (Baumeister & Campbell, 1999; Paulhus, 2014). For example, researchers found that 6.9% of college students have a dispositional tendency to show sadistic behaviors through the analysis of self-reported data from 407 Irish students (O'Meara, Davies, & Hammond, 2011). On the basis of previous studies, Buckels (2012) denoted the

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<https://doi.org/10.1016/j.paid.2021.110875>

Received 31 December 2020; Received in revised form 20 March 2021; Accepted 24 March 2021

Available online 2 April 2021

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inappropriately pleasant reaction to someone else's suffering in the nonclinical population as *everyday sadism*. After studied a constellation of aversive personalities, Paulhus (2014) added everyday sadism into the "Dark Triad" as the fourth trait. Due to the development of information technology, the daily lives of people, especially adolescents, are exposed to violent movies, sports (such as boxing and cage fighting) and video games. The aggressive behaviors and bloody scenes in movies, sports and games attract people's attention for a long time, making everyday sadism a part of people's daily lives. Therefore, the formation mechanism of everyday sadism and its impact on the growth of adolescents has become an important topic for psychologists.

With the introduction of everyday sadism, the assessment of sadistic behaviors is no longer categorically "positive" or "negative". Indeed, sadism needs to be measured and evaluated on a continuum ranging from "weak" to "strong". In the clinical field, researchers have employed the Millon Clinical Multiaxial Inventory III (MCMI-III; Millon, Millon, & Davis, 1994) for the diagnosis of sadistic personality disorder (SPD). Researchers have also updated a rating scale to assess sexual sadism in crime scenes (Myers, Beauregard, & Menard, 2019). However, in the daily context, sadism is regarded as a personality trait, which is mainly measured with the Short Sadistic Impulse Scale (SSIS; O'Meara et al., 2011), the Varieties of Sadistic Tendencies scale (VAST scale; Paulhus, Jones, Klonsky, & Dutton, 2011) and the Assessment of Sadistic Personality scale (ASP scale; Plouffe, Saklofske, & Smith, 2017).

Among them, the VAST scale is used most frequently. This scale is a 5-point self-reported assessment and includes 16 items that measure the two dimensions of sadism (i.e., direct sadism and vicarious sadism). Specifically, direct sadism means that individuals obtain a pleasant experience from others' physical or psychological suffering directly, and vicarious sadism refers to individuals' enjoyment of watching others' aggressive behaviors (such as watching boxing matches or movies). The VAST scale has been used in research related to everyday sadism in nonclinical populations (Buckels, 2012; Buckels et al., 2013; Buckels, Trapnell, & Paulhus, 2014), and it has been demonstrated to have high reliability and validity in Chinese individuals (Yang, Yin, Cheng, Liu, & Zhang, 2018).

1.2. Concept and measurement of impulsivity

Recently, Moeller, Barratt, Dougherty, Schmitz, and Swann (2001) argued that impulsivity is an independent personality trait. They believe that highly impulsive individuals have a predisposition to exhibit rapid, unplanned reactions to internal or external stimuli with no regard for the negative consequences of these reactions affecting the impulsive individual or others. Also, they found that borderline personality disorder, antisocial personality disorder, substance abuse/dependence, bipolar disorder, attention deficit and hyperactivity disorder (ADHD), and conduct disorder are all related to impulsive personality traits. Moreover, impulsive traits are predictively related to suicidal behavior (Oquendo et al., 2000), problem gambling (Vitaro, Arseneault, & Tremblay, 1999), drug abuse and addiction (Acheson, Vincent, Sorocco, & Lovallo, 2011; Audrain-McGovern et al., 2009). Therefore, impulsivity is considered to be the core trait that causes maladaptive behavior, interpersonal barriers, bad habits, etc.

Barratt (1985) proposed an operational definition of impulsive traits; he argued that impulsive traits are composed of three subtraits: cognitive impulsiveness, motor impulsiveness, and non-planning impulsiveness. Among them, motor impulsiveness was defined as acting without thinking and being insensitive to the negative consequences of behavior, cognitive impulsiveness involved making cognitive decisions before completely processing the information, non-planning impulsiveness was characterized as "present orientation" and a lack of consideration for long-term consequences. According to this definition, the Barratt Impulsive Personality Scale (BIS) was developed and revised.

There are three primary methods for measuring impulsive traits: self-reporting, laboratory experiments and neuroscience technologies

(Moeller et al., 2001). Among these methods, survey studies based on self-reported scales, such as the Eysenck Impulsiveness Questionnaire and Barratt Impulsiveness Scale, were the first to be applied in a broad context. It is very convenient and economical to measure impulsive traits through self-reported scales. However, the accuracy of survey results depends on participants' honesty and carefulness when they fill out scales (Stratton, 2015). The BIS is the most widely used scale for measuring impulsive traits. The scale has been revised several times, and BIS-11 is one of the most commonly used versions.

1.3. Sadism, impulsivity and aggression

In general, aggression refers to any behavior performed by individuals who are in certain emotional or physiological arousal states for the purpose of harming another person (DeWall, Anderson, & Bushman, 2011). Thus, aggressive behaviors have three characteristics: (1) the behavior can be motivated by the attacker's specific emotional or physiological arousal states (such as anger); (2) the behavior can cause physical or psychological harm to others; and (3) the behavior is not accepted by the victim.

Because of the varieties and multiple motivations of aggressive behaviors, researchers have classified aggressive behaviors according to different criteria. Dodge and Coie (1987) classified aggressive behaviors into two distinct subtypes—proactive and reactive aggression—which have been approved by numerous researchers (Crick & Dodge, 1996; Poulin & Boivin, 2000; Raine et al., 2006; Vitaro & Brendgen, 2005). The above authors held that reactive aggression is an individual's defensive reaction against others' attacks, such as counterattacks against others' insults. They also regarded proactive aggression as intentional, purposeful aggression (such as bullying and abuse) committed by an individual who has not been provoked by others. Subsequent research found that there is a significant difference between proactive and reactive aggression in terms of personality. For example, reactive aggression is closely related to neuroticism in the five-factor model of personality (Miller & Lynam, 2006), but proactive aggression is positively associated with narcissism (Seah & Ang, 2008).

Studies have shown that there is a positive correlation between impulsive traits and aggressive behaviors both in clinical and nonclinical populations (Moeller et al., 2001). Hatfield and Dula (2014) also found a positive correlation between impulsive traits and physical aggression in a study in which the BIS-11 and a subscale from the Buss-Perry Aggression Questionnaire (BPAQ) were used. Researchers have also found that aggression, which is evoked by provocation and irritation, usually entails impulsive and thoughtless behavior (Babcock, Tharp, Sharp, Heppner, & Stanford, 2014; Bushman & Anderson, 2001). In other words, impulsivity is more likely to be tied to reactive aggression.

Simultaneously, previous studies have found that sadism also has a link with aggression (Buckels et al., 2013; Paulhus et al., 2011). Similarly, a few studies have examined the characteristics of aggressive behaviors predicted by sadism. For example, Buckels (2012) used the white noise aggression task to explore the feature of aggressive behaviors predicted by sadism, and he found that sadists are likely to give punishment to innocent persons who did not show any aggressive behaviors. Moreover, Reidy et al. (2011) found that sadists are more likely to employ aggressive tactics even in unprovoked situations. These results imply that sadism may be strongly related to proactive aggression.

In other words, it is possible that a difference between the aggressive behaviors predicted by sadism and those predicted by impulsivity will manifest as the sadistic trait more strongly predicting proactive aggression and the impulsive trait more strongly predicting reactive aggression.

1.4. Overview and hypotheses

In summary, although some studies have indicated that aggressive behaviors can be predicted by both sadistic and impulsive traits

(Babcock et al., 2014; Buckels et al., 2013; Bushman & Anderson, 2001; Reidy et al., 2011), few studies have aimed to clarify how the two forms of aggression (i.e., reactive and proactive aggression) are characterized by sadistic traits and impulsive traits, respectively. As discussed above, we hypothesized that sadism and impulsivity predict aggressive behaviors differently. Specifically, highly sadistic individuals are more likely to show proactive aggression compared to individuals with low sadism, and highly impulsive individuals are more likely to exhibit reactive aggression compared to individuals with low impulsivity.

To test this hypothesis, the comparison of the strength of reactive aggression or proactive aggression between highly sadistic and highly impulsive individuals is logically appropriate. However, sadism and impulsivity are closely related to each other (Velotti & Garofalo, 2015). Moreover, sadism and impulsivity jointly promote aggressive behaviors. Specifically, individuals with high sadism tend to obtain pleasure from aggression, and the link between aggression and positive, rewarding experiences is progressively established. Such a positive, rewarding experience influences decision-making processes, likely making individuals engage in impulsive acts, which again strengthens the link between aggression and positive, rewarding experiences. This positive feedback loop can be derived from the general aggression model, which emphasizes that internal states (i.e., arousal and affect) and decision-making processes play important roles in the emergence of aggression (Anderson & Bushman, 2002; DeWall et al., 2011). Therefore, a comparison between sadism and impulsivity is incomprehensible, and it is better to determine which trait serves as a better predictor of reactive or proactive aggression. Consequently, we compared highly sadistic and highly impulsive individuals to the control group (i.e., individuals with ranks of VAST scores and BIS-11 scores of at least one standard deviation below the mean). At the same time, we employed dominance analysis, which is an extension of multiple regression and can be used to investigate the relative importance of predictors, even in the presence of correlated predictors (Azen, 2013; Budescu, 1993).

Accordingly, three studies were conducted. In Study 1, we used self-reported scales to measure sadism, impulsivity and the level of reactive and proactive aggression. Then, we further explored the relation between the two traits and the level of reactive and proactive aggression through laboratory paradigms in Studies 2 and 3 to further examine the different degrees of performance between highly sadistic or highly impulsive individuals and the control group regarding reactive or proactive aggression. Stimulus materials and data for all the experiments are available on the Open Science Framework under the following link: https://osf.io/f8rab/?view_only=9615f99018ce4137b89a3e2b5c7069d4.

2. Study 1: exploring the relationship between sadistic/impulsive traits and aggression using scales

In this study, we explored the relationship between sadistic/impulsive traits and reactive/proactive aggression using corresponding scales to measure sadistic and impulsive traits and aggressive behaviors. Here, we used the adapted Chinese version of the VAST scale and BIS-11 to measure sadistic and impulsive traits, respectively, and employed the adapted Chinese version of the Reactive-Proactive Aggression Questionnaire (RPQ; Raine et al., 2006) to assess the level of reactive and proactive aggression in nonclinical populations. These scales have been documented to have satisfactory psychometric properties in Chinese subjects (Li et al., 2011; Yang et al., 2018; Zhang, Jia, Chen, & Zhang, 2014).

2.1. Methods

2.1.1. Participants

We planned to recruit over 1000 subjects in Study 1. As indicated by Algina and Olejnik (2003), this sample size provides adequate power (0.90) to detect corrections as small as 0.10 at the 0.05 alpha level. A

sample of 1310 undergraduates was recruited from a population of students at Ningbo University and Zhejiang Textile and Fashion College in China, and 1257 completed assessments were collected. Seventy-four participants were excluded because of missing data or invalid responses (e.g., choosing the same option for all items on the scale). Finally, 1183 completed scales were analyzed (for an effective response rate of 90.3%). The subjects were aged 17–22 years ($M = 18.25$, $SD = 0.64$), including 579 males (48.94% of the total sample). This study was approved by the Research Ethics Board of the Department of Psychology at authors' university, and it was performed in accordance with relevant guidelines and regulations.

2.1.2. Materials

- (1) The adapted Chinese version of VAST: This scale was used to assess sadistic personality traits. It is composed of 13 items ($\alpha = 0.86$), of which the dimension of direct sadism contains 7 items ($\alpha = 0.82$) and the dimension of vicarious sadism contains 6 items ($\alpha = 0.71$). Responses were made using 7-point scales from 1 (not at all) to 7 (very much). The scale has satisfactory psychometric properties for measuring sadism in Chinese subjects (Yang et al., 2018).
- (2) The adapted Chinese version of BIS-11: This scale ($\alpha = 0.89$) includes three dimensions—cognitive impulsiveness ($\alpha = 0.80$), motor impulsiveness ($\alpha = 0.81$) and non-planning impulsiveness ($\alpha = 0.84$). Each dimension consists of 10 items, and participants were required to grade each item on a 5-point scale. A high score indicates a high level of impulsivity. The scale is also effective in measuring impulsive traits in Chinese subjects (Li et al., 2011).
- (3) The adapted Chinese version of the RPQ: This scale consists of 23 items ($\alpha = 0.86$), and each item is scored on a 3-point scale. The scale can be further divided into two subscales. One of the subscales consists of 11 items that is used to measure reactive aggression ($\alpha = 0.80$), and another subscale, which is used to measure proactive aggression, consists of 12 items ($\alpha = 0.83$). The reliability and validity of this scale are good (Zhang et al., 2014).

2.1.3. Procedure

The three scales were bound into a booklet in a fixed order (the sequence is VAST, BIS-11 and RPQ). Data were collected by psychology graduate students in group tests. Participants usually completed all scales in approximately 15 min.

2.2. Results and discussion

To explore the relationship between sadism and reactive/proactive aggression, the Pearson product-moment correlation coefficient between the VAST score and reactive aggression or proactive aggression in the RPQ was calculated separately. The results showed that there was a significant positive correlation between the VAST score and proactive aggression ($r = 0.44$, $p < .01$) or reactive aggression ($r = 0.32$, $p < .01$). These findings suggest that sadism is positively correlated with proactive and reactive aggression. Meanwhile, to investigate the relationship between impulsivity and reactive/proactive aggression, the Pearson product-moment correlation coefficient between the BIS-11 score and reactive aggression or proactive aggression in the RPQ was also calculated separately. There was a significantly positive correlation between the BIS-11 score and both proactive aggression ($r = 0.26$, $p < .01$) and reactive aggression ($r = 0.34$, $p < .01$). Hence, both traits—sadism and impulsivity—are related to aggressive behaviors. At the same time, the correlation coefficients related to sadism and impulsivity were compared, and the relationships between the subdimensions of sadism/impulsivity and aggressive behaviors were explored. These results can be seen in the Supplementary Materials.

To further clarify the relationship between sadistic or impulsive

traits and reactive/proactive aggression, we standardized the VAST scores, BIS-11 scores, and reactive/proactive aggression scores in the RPQ. Then, we applied stepwise regression analysis on the standard scores of the VAST or BIS-11 as predictive variables and the standard scores of reactive/proactive aggression in the RPQ as independent variables. The results of stepwise regression analysis are shown in Table 1.

According to Table 1, sadistic and impulsive traits were entered into the regression equation, which was used to predict reactive aggression. Specifically, the two variables can jointly explain 17% of the variance of reactive aggression ($F(1, 1180) = 125.87, p < .001$), with impulsive traits explaining 11% of the variance of reactive aggression and sadism explaining 6% of the variance of reactive aggression. When sadistic and impulsive traits were treated as predictors of proactive aggression, both predictive variables also entered the regression equation. Specifically, the two variables can jointly explain 22% of the variance of proactive aggression ($F(1, 1180) = 168.11, p < .001$), with impulsive traits explaining 3% of the variance of proactive aggression and sadism explaining 19% of the variance of proactive aggression.

According to the results, the correlation analyses provide initial evidence that highly sadistic individuals are more likely to show proactive aggression and that reactive aggression is more likely to occur in highly impulsive individuals. Next, we will provide more evidence for this conclusion through two behavioral experiments.

3. Study 2: is impulsivity more predictive of reactive aggression than is sadism?

In this study, three groups of participants were selected from Study 1: a highly sadistic group, a highly impulsive group, and a control group with both low sadism and low impulsivity. In other words, we dichotomized participants according to their VAST and BIS-11 scores. Although there are some limitations concerning the transformation of continuous variables into categorical variables, such an action can be justified in some situations, such as when handling variables with skewed distributions (DeCoster, Gallucci, & Iselin, 2011), and the artificial categorization of variables can make a more parsimonious interpretation of analyses and improve communication among researchers (Farrington & Loeber, 2000). Therefore, we artificially categorized participants into three groups. To induce and compare the strength of reactive aggression in these three groups of subjects, we used the Taylor aggression paradigm (TAP), which is a well-established behavioral laboratory measure of reactive aggression and has been proven to have good external validity (Giancola & Parrott, 2008; Lotze, Veit, Anders, & Birbaumer, 2007). If the results of Study 1 were conclusive, we would expect that reactive aggression should be different between exceptionally high and low levels of impulsivity, but not between exceptionally high and low levels of sadism. Namely, the highly impulsive individuals would show stronger reactive aggression than that in the control group, but no such difference should be found between the highly sadistic individuals and the control group.

3.1. Methods

3.1.1. Participants

Because the VAST scores of all subjects in Study 1 were not normally distributed ($skewness = 1.63, kurtosis = 3.44$) and showed significant

differences between males and females ($M_{male} = 1.54, M_{female} = 1.31, t = 9.52, p < .001$), we converted male and female raw VAST scores into percentile ranks separately to determine the criteria for different groups. Moreover, the BIS-11 scores of all subjects in Study 1 obeyed a near normal distribution ($skewness = 0.21, kurtosis = 0.17$) but showed differences between genders ($M_{male} = 33.20, M_{female} = 34.62, t = 2.06, p < .05$). Hence, we determined the criteria for different groups according to male and female raw BIS-11 scores separately.

Finally, three groups of individuals were categorized: (1) individuals whose ranks of VAST scores were at least one standard deviation above the mean (i.e., $VAST_{male} \geq 1.92, VAST_{female} \geq 1.62$) and their BIS-11 scores were less than or equal to the mean (i.e., $BIS-11_{male} \leq 33.20, BIS-11_{female} \leq 34.62$) were classified into a highly sadistic group; (2) individuals whose BIS-11 scores were at least one standard deviation above the mean (i.e., $BIS-11_{male} \geq 44.59, BIS-11_{female} \geq 46.90$) and their ranks of VAST scores were less than or equal to the mean (i.e., $VAST_{male} \leq 1.54, VAST_{female} \leq 1.31$) were classified into the highly impulsive group; and (3) individuals with ranks of VAST scores and BIS-11 scores at least one standard deviation below the mean (i.e., $VAST_{male} \leq 1.08, VAST_{female} \leq 1.00$ and $BIS-11_{male} \leq 21.81, BIS-11_{female} \leq 22.34$) were classified into the control group.

Sadism and impulsivity are all related to aggressiveness, and previous meta-analytic estimates of the mean *Personality-Difference Effect Sizes* (i.e., the effect size is estimated by comparing the aggressive behaviors between individuals who scored high on a particular personality variable with those who scored low) of trait aggressiveness yielded $d = 0.71-0.84$ (Bettencourt, Talley, Benjamin, & Valentine, 2006). We used G*Power 3 (Faul, Erdfelder, Buchner, & Lang, 2009) to determine the sample size of Studies 2 and 3 by setting the alpha level at 0.05 and the effect size at 0.71, and we found that a sample size of 30 subjects provided adequate power (0.85). Finally, 30 highly sadistic individuals (15 males and 15 females), 30 highly impulsive individuals (15 males and 15 females) and 30 individuals in the control group (15 males and 15 females) were assigned to either Study 2 or Study 3. All experimenters and participants in Studies 2 and 3 were blind to which participants were in which group as well as the aims of the studies. Both studies were approved by the Research Ethics Board of the Department of Psychology at authors' university, and they were performed in accordance with relevant guidelines and regulations. Information sheets were distributed to all participants before the experiment, and after learning the procedure of the experiment, they gave their written informed consent.

3.1.2. Procedure and design

To induce participants' reactive aggression, we adopted the classical TAP to create a competitive and interpersonally adversarial context. In this task, participants are informed that they are competing against an opponent (actually a computer program) on response speed. First, participants saw a black square (600 * 600 pixels) appear on the computer screen in each trial, and the colour of this square changed from black to green after 1000–2000 ms. When the square changed to green, participants were asked to press the button as soon as possible and were told that their opponents did the same task. They had to compete with their opponents, and the person who pressed the button first was deemed the winner. They were told to be able to set an aversive noise blast from 10 possible levels with values ranging from 0 to 9 at the beginning of the trial, and the noise would be played for 1 s at the end of

Table 1
Regression analysis of aggression and sadistic & impulsive traits.

Dependent variable	Predictive variables	R^2	ΔR^2	ΔF	B	Standard regression coefficient	t
Reactive aggression	Impulsive	0.11	0.11***	151.55***	0.09	0.28	10.43***
	Sadism	0.18	0.06***	88.82***	2.16	0.26	9.43***
Proactive aggression	Impulsive	0.22	0.03***	44.19***	0.03	0.18	6.65***
	Sadism	0.19	0.19***	281.73***	1.68	0.40	15.26***

*** $p < .001$.

this trial for opponents/participants, according to which person won. Regarding the level of noise intensity, 0 represented 0 dB with a non-aggressive response, 1 to 9 corresponded to 70 to 105 dB with a step of 5 dB, and participants used the mouse to click on the noise level in a scale. If participants won a trial, their chosen noise would be delivered to their opponents at the end of this trial; otherwise, the opponents earned a chance to deliver an aversive noise blast to participants at the end of this trial (see Fig. 1).

The winner and loser of each trial were actually determined by a computer program in advance. Participants needed to complete 25 trials, and they always won in the first trial. The remaining 24 trials were separated into 4 blocks. In each block, participants won half of the trials (i.e., won 3 trials and lost 3 trials). To familiarize participants with the subjective feeling of different noises, they were asked to listen to three levels of noise: 70 dB (level 1), 80 dB (level 3), and 90 dB (level 5) before the experiment. On the trials in which participants won, the noise set by participants was sent to their opponents. On the trials in which participants lost, they were randomly given one of the noise blasts whose level of intensity ranged from 0 to 9. The mean noise intensity that participants received in different blocks gradually increased (the order of winning and losing trials and the intensity of noise in different blocks can be seen in Supplementary Table 1).

There was no opponent in reality. To make the participants believe that the opponent is real, two same-sex participants (or an assistant and a participant) always joined in the experiment at the same time. They were told that they would play a game together, while they actually completed their own experiment in separate rooms. There was no opportunity for face-to-face interaction between participants and their opponents. After the experiment, the researchers explained the actual experimental settings to the participants and asked the participants whether they believed the opponent was a real person. It was found that all participants believed that the opponents were real. Meanwhile, in the post-task interview, participants thought that this experiment created a provocative situation and they experienced some negative affect (such as irritation) when opponents delivered an aversive noise blast to them, which is consistent with the characteristics of reactive aggression (Poulin & Boivin, 2000; Vitaro & Brendgen, 2005).

At the same time, given that participants were not offended by

opponents at the beginning of the experiment, referring to previous studies (Giancola & Parrott, 2008; Meier, Robinson, & Wilkowski, 2006; Riva et al., 2017), the noise intensity in the first trial could not reflect the level of participants' reactive aggression and thus was excluded. The average noise intensity of the remaining 24 trials was regarded as an indicator of the strength of participants' reactive aggression. In view of the different criteria of impulsivity or sadism for male and female participants and sex differences in aggressive behaviors (Anderson & Bushman, 2002), we also analyzed whether the participant's sex influenced the set noise intensity.

3.2. Results and discussion

The analyses of noise intensities in different blocks are shown in the Supplementary Materials. We conducted a 3 (group: highly sadistic vs. highly impulsive vs. control) $\times$ 2 (sex: male vs. female) two-way between-subjects ANOVA for the noise intensity across all blocks. It revealed that the main effect of group condition ($F(2, 84) = 5.99, p = .004, \eta^2_p = 0.13$) was significant. However, the main effect of sex ($F(1, 84) = 0.01, p = .942, \eta^2_p < 0.01$) and the interaction effect between group condition and sex ($F(2, 84) = 0.32, p = .730, \eta^2_p = 0.01$) did not reach significance. These results suggested that there was no significant difference between males and females in the reactive aggression strength, so we did not divide participants according to sex.

The noise intensity set by the three groups of participants (see Fig. 2) was evaluated by one-way between-subjects ANOVA. It revealed that the three groups of individuals differed significantly in reactive aggression strength ($F(2, 87) = 6.16, p = .003, \eta^2_p = 0.12$). LSD post hoc tests showed that the noise intensities between highly sadistic individuals ($M = 3.32, SD = 1.44$) and the control group ($M = 2.79, SD = 1.38$) did not differ significantly ($p = .184$), while the noise intensity set by highly impulsive individuals ($M = 4.17, SD = 1.77$) was larger than that of the control group ($M = 2.79, SD = 1.38; p = .001$). Besides, the noise intensity set by highly impulsive individuals ($M = 4.17, SD = 1.77$) was larger than that of highly sadistic individuals ($M = 3.32, SD = 1.44; p = .035$). In addition, these effects were not moderated by the factor of sex, as the interaction effect between group condition and sex ($F(2, 84) = 0.32, p = .730, \eta^2_p = 0.01$) did not reach significance.

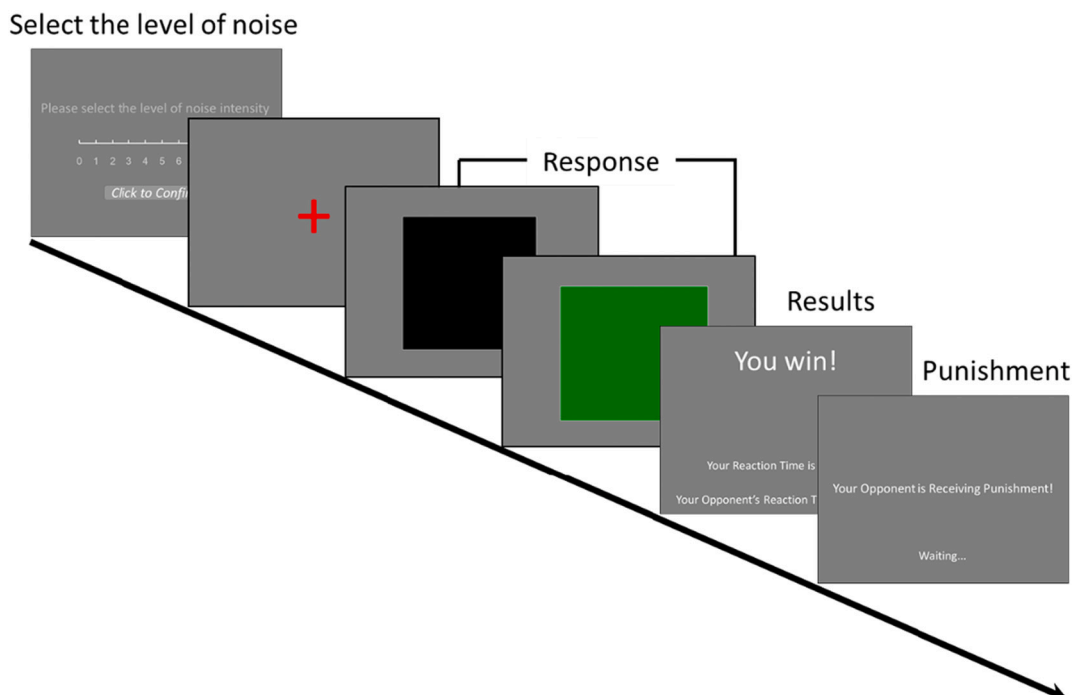


Fig. 1. Depiction of an example trial sequence from Study 2.

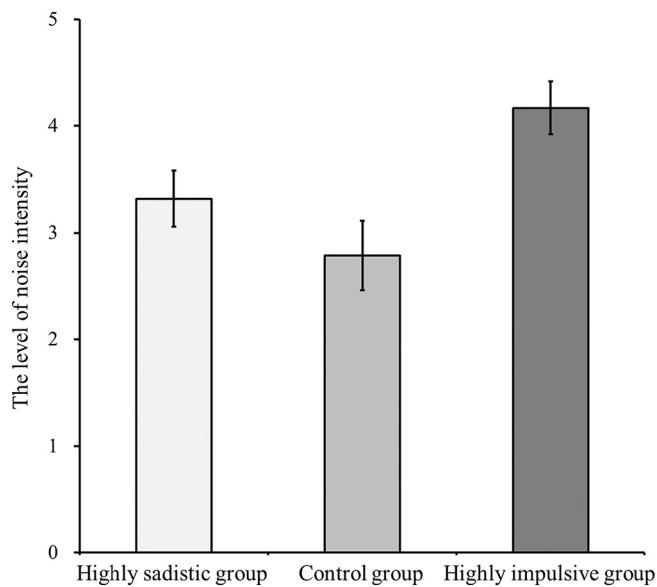


Fig. 2. The level of noise intensity set by different groups of participants in Study 2. Error bars represent the standard error.

Moreover, we employed dominance analysis to determine which traits are more important for the prediction of reactive aggression. Specifically, we first ran an ordinary least squares (OLS) regression among sadistic traits, impulsive traits and reactive aggression, and then, we examined the contributions of the two traits to probe which of the two affects reactive aggression the most. The above analysis was conducted in R using the “dominance analysis” package (Bustos Navarette & Coutinho Soares, 2020). Finally, the OLS regression results show that impulsive traits are significantly positively related to reactive aggression ($b = 0.03, p = .001$), while the coefficients of sadistic traits are positive but not significant ($b = 0.09, p = .771$). Moreover, the average contribution of impulsive traits (0.114) was higher than that of sadistic traits (0.001).

Consequently, compared with lowly impulsive individuals (i.e., control group), highly impulsive individuals showed stronger reactive aggression, while no such effect was found for highly sadistic and lowly sadistic individuals (i.e., the control group). Moreover, impulsive traits are more important for the prediction of reactive aggression. These results suggest that impulsivity drives reactive aggression over and above sadism traits.

4. Study 3: is sadism more predictive of proactive aggression than is impulsivity?

The results of Study 2 established experimental evidence that reactive aggression is mainly driven by impulsive traits. To further explore the proactive aggressive behaviors between sadism and impulsivity, we modified the TAP to measure participants' proactive aggression without provoking them. This modification was consistent with the characteristics of proactive aggression, as previous researchers pointed out that the noise intensity set by participants to their opponents can be considered a measure of proactive aggression in the nonprovoking condition (Bobadilla, Wampler, & Taylor, 2012; Gan, Sterzer, Marxen, Zimmermann, & Smolka, 2015). If the sadistic traits were associated with proactive aggression, as suggested in Study 1, then we would expect that proactive aggression would be different between exceptionally high and low levels of sadism but not between exceptionally high and low levels of impulsivity. Namely, highly sadistic individuals would show stronger proactive aggression compared to individuals in the control group, but highly impulsive individuals would not differ from the control group in terms of proactive aggression.

4.1. Methods

A new set of 30 highly sadistic individuals (15 males and 15 females), 30 highly impulsive individuals (15 males and 15 females), and 30 individuals in the control group (15 males and 15 females) were selected according to the criteria of Study 2.

To induce participants' proactive aggression, we modified the experimental paradigm in Study 2. Specifically, before the TAP task, participants were asked to complete Raven's Standard Progressive Matrices (RSPM) assessment, which can test a person's reasoning ability. A few minutes after completing the RSPM, participants were informed that their scores were higher than those of their opponents and that they earned the privilege to avoid noise blasts when they lost a trial. The next procedure was the same as Study 2, except that participants did not hear the noise even if they lost a trial. Participants also needed to complete 25 trials, and they were not irritated in each trial, so the mean noise intensity of all 25 trials was regarded as an indicator of the strength of the participant's proactive aggression.

In the post-task interview, participants believed that their opponents were real, so all participants' data were included and analyzed. Moreover, most participants reported that they did not feel provoked during the experiment (rarely, participants could not clarify their feelings clearly), so setting the noise to opponents can be seen as proactive aggression.

4.2. Results and discussion

The analysis of the intensities of different blocks is shown in the Supplementary Materials. A 3 (group: highly sadistic vs. highly impulsive vs. control) $\times$ 2 (sex: male vs. female) between-subjects ANOVA was employed for the noise intensity across all blocks. It revealed that the main effect of group condition ($F(2, 84) = 3.28, p = .043, \eta_p^2 = 0.07$) is significant. However, the main effect of sex ($F(1, 84) = 0.22, p = .640, \eta_p^2 < 0.01$) and the interaction effect between group condition and sex did not reach significance ($F(2, 84) = 0.424, p = .656, \eta_p^2 = 0.01$). These results suggested that there was no significant difference between proactive aggression strength for males and females, so we did not divide participants according to sex.

The noise intensities set by the three groups of participants (see Fig. 3) were submitted to a one-way between-subjects ANOVA. It revealed that the three groups of individuals differed significantly in

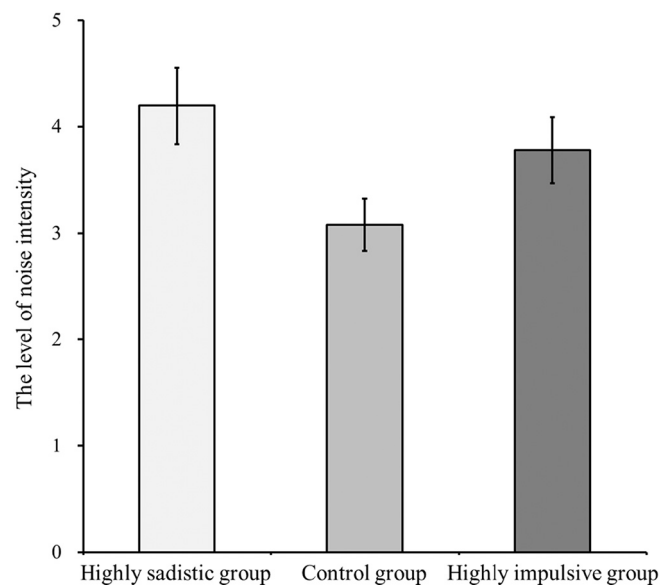


Fig. 3. The level of noise intensity set by different groups of participants in Study 3. Error bars represent the standard error.

proactive aggression strength ($F(2, 87) = 3.35, p = .040, \eta^2_p = 0.07$). LSD post hoc tests showed that the noise intensity set by highly sadistic individuals ($M = 4.20, SD = 1.97$) was larger than that of the control group ($M = 3.08, SD = 1.34; p = .012$), and the noise intensities between highly impulsive individuals ($M = 3.78, SD = 1.70$) and the control group ($M = 3.08, SD = 1.34; p = .112$) showed a non-significant difference. In addition, the noise intensities between highly sadistic individuals ($M = 4.20, SD = 1.97$) and highly impulsive individuals ($M = 3.78, SD = 1.70$) did not differ significantly ($p = .341$). In any case, only the highly sadistic individuals showed stronger proactive aggression than the lowly sadistic individuals (i.e., control group).

Similar to Study 2, dominance analysis was also employed. The OLS regression results show that sadistic traits positively predict proactive aggression ($b = 0.76, p = .034$), while the coefficients of impulsive traits are positive but not significant ($b = 0.01, p = .174$). Moreover, the average contribution of sadistic traits (0.05) was higher than that of impulsive traits (0.02).

Therefore, compared with lowly sadistic individuals (i.e., control group), highly sadistic individuals had stronger proactive aggression, but no significant difference was found between the proactive aggression strength of highly impulsive individuals and that of lowly impulsive individuals (i.e., control group). Hence, these results indicate that sadism drives proactive aggression over and above impulsive traits.

5. General discussion

Previous research found that sadistic and impulsive traits were strongly linked to aggression (Buckels et al., 2013; Hatfield & Dula, 2014; Paulhus et al., 2011; Piko & Pinczés, 2014). Notably, some researchers assumed that the features of aggressive behaviors predicted by sadistic and impulsive traits may be different (Bushman & Anderson, 2001; Buckels et al., 2013; Babcock et al., 2014; Reidy et al., 2011). However, few studies have directly compared the characteristics of aggression between highly sadistic and highly impulsive individuals.

Using self-reported questionnaires, we found that sadism correlated positively with scores of proactive aggression and impulsivity was related strongly to scores of reactive aggression. Furthermore, using two experimental studies, we addressed the features of aggression predicted by sadistic and impulsive traits. It was found that provocation led to more reactive aggression in highly impulsive individuals than that in lowly impulsive individuals (i.e., control group), and highly sadistic individuals showed more proactive aggression than that in lowly sadistic individuals (i.e., control group) in an unprovoked situation. Based on the results of all three studies, it can be considered that individuals with sadistic traits are more likely to show proactive aggression, while the aggressive behaviors characterized by impulsive individuals are mainly reactive.

5.1. Sadism and proactive aggression

Sadism is associated with aggression, such as killing more insects, delivering a greater white-noise blast to their opponents, showing more online bullying behaviors, and more self-reported acts of sexual abuse (Buckels et al., 2013; March, Grieve, Marrington, & Jonason, 2017). Importantly, sadistic tendencies not only occur in violent criminals but also appear in nonclinical or noncriminal populations, which is simply called *everyday sadism* (Buckels et al., 2013). Similar to previous studies, everyday sadism in subclinical populations was also discovered in our studies. Moreover, our research was consistent with recent studies that found a robust link between sadism and aggression toward both innocent targets and provocateurs (Chester, DeWall, & Enjaian, 2019) but extended this link further, showing that sadism mainly predicts aggression toward innocent targets (i.e., proactive aggression).

Proactive aggression is the instrumental use of aggression for obtaining a desired goal (Crick & Dodge, 1996), meaning that proactive aggression may be a deliberate behavior motivated by external purposes,

such as getting pleasure. Sadism is also characterized by the affliction of getting pleasure from the suffering of others (Baumeister & Campbell, 1999). Compared to taking enjoyment from others' pain passively, it is probable that sadists actively harm innocent people or perform aggression, even if they are not provoked, to seek pleasure (O'Meara et al., 2011). In our studies, we found that highly sadistic individuals had a higher level of proactive aggression toward opponents who refused to retaliate than that in the control group. In other words, we also ascertained that highly sadistic individuals are more likely to hurt innocent people in unprovoked situations. This tendency may be driven by the desire to seek pleasure. Further studies can address this question by measuring individuals' emotions.

5.2. Impulsivity and reactive aggression

More aggression has been observed in highly impulsive individuals compared to controls. Furthermore, impulsivity is defined as quick-acting without deliberate thinking (Vigil-Colet & Codorniu-Raga, 2004). Highly impulsive individuals often respond quickly to internal or external stimuli, regardless of whether their reactions have a negative impact on themselves or others (Moeller et al., 2001). Likewise, the results from some studies indicate that people with a high level of impulsivity (i.e., highly impulsive individuals) have difficulty controlling certain behaviors (Barratt, 1985).

Therefore, highly impulsive individuals are inclined to get angry when provoked. Subsequently, anger, which is an emotional drive, and low response control facilitate aggressive behaviors. This form of aggressive behavior is a defensive response to provocation or a perceived threat and is defined as reactive aggression. In our studies, we found that highly impulsive individuals had more reactive aggression than that in the control group, meaning highly impulsive individuals are more likely to exhibit aggression reactions in response to a person provoking them. This tendency may be driven by immediate anger.

In addition to previously demonstrating that proactive and reactive aggression have different expression patterns, eliciting factors, neural pathways, and development, our research indicates that these two types of aggression are dominated by different traits.

5.3. Limitations

Our findings should be interpreted with caution because there are several limitations to our present study. First, participants were predominantly undergraduates. Although some researchers have pointed out that findings from undergraduate samples are similar to those from the general population in many cases (Bennis & Medin, 2010; Danks & Rose, 2010; Maryanski, 2010), which suggests that our current sample is reasonable, the homogeneity of participants limits the generalizability of our findings. However, other researchers have indicated that relying on limited samples (such as undergraduates and WEIRD subjects) to make general claims has become a growing concern (Henrich, Heine, & Norenzayan, 2010). Therefore, future studies should investigate diverse samples to strengthen the present conclusions. Moreover, participants in our present study were from a normal population, and future studies can recruit participants from subclinical or clinical populations to explore whether the enhanced effect of aggression exists in individuals with highly sadistic and highly impulsive traits. Second, we used a classical TAP and a modified TAP to measure reactive and proactive aggression in Studies 2 and 3, respectively. However, the TAP has limitations, such as encouraging aggressive responses for other reasons (Tedeschi & Quigley, 1996) and the manifestation of aggressive behaviors in other forms (Elson, Mohseni, Breuer, Scharkow, & Quandt, 2014). Therefore, future studies should measure the level of aggression based on other laboratory aggression paradigms or more ecological behavioral measurements.

6. Conclusions

Through these three studies, we explored how aggressive behaviors are characterized by sadistic traits and impulsive traits. We found that highly sadistic individuals have greater proactive aggression compared to those in the control group, while highly impulsive individuals exhibit more reactive aggression compared to those in the control group. This finding suggests that sadistic and impulsive traits are associated with different types of aggression, that sadistic traits are more predictive of proactive aggression than are impulsive traits, and that impulsive traits are more strongly connected to reactive aggression than are sadistic traits.

CRediT authorship contribution statement

Jipeng Duan: Conceptualization, Methodology, Investigation, Formal analysis, Writing – original draft, Writing – review & editing, Validation. **Zhangxiang Yang:** Conceptualization, Methodology, Investigation, Formal analysis. **Feng Zhang:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing. **Yanyan Zhou:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Validation. **Jun Yin:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Validation.

Declaration of competing interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Acknowledgments

This work was supported by the Special Foundation of Philosophy and Social Science in Zhejiang Province for Young Talents (浙江省哲学社会科学领军人才培养专项课题 (青年英才培育); Grant no. 21QNYC12ZD).

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.paid.2021.110875>.

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Update

Personality and Individual Differences

Volume 179, Issue , September 2021, Page

DOI: <https://doi.org/10.1016/j.paid.2021.110956>



Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid



Corrigendum

Corrigendum to “Aggressive behaviors in highly sadistic and highly impulsive individuals” [Personality and Individual Differences 178 (2021) 1–9/110875]

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The authors regret for the misplaced citation in “5.3. Limitations” of original article. The article of Bennis & Medin (2010) in “Although some researchers have pointed out that findings from undergraduate samples are similar to those from the general population in many cases (Bennis & Medin, 2010; Danks & Rose, 2010; Maryanski, 2010), which suggests that our current sample is reasonable, the homogeneity of participants limits the generalizability of our findings.” is in wrong position, it should be placed in “However, other researchers have indicated that relying on limited samples (such as undergraduates and WEIRD subjects) to make general claims has become a growing concern (Henrich, Heine, & Norenzayan, 2010).”

After the correction, the sentences in this part should be like: “First, participants were predominantly undergraduates. Although some researchers have pointed out that findings from undergraduate samples are similar to those from the general population in many cases (Danks & Rose, 2010; Maryanski, 2010), which suggests that our current sample is reasonable, the homogeneity of participants limits the generalizability of our findings. However, other researchers have indicated that relying on limited samples (such as undergraduates and WEIRD subjects) to make general claims has become a growing concern (Bennis & Medin, 2010; Henrich, Heine, & Norenzayan, 2010).”

The authors would like to apologise for any inconvenience caused.

DOI of original article: <https://doi.org/10.1016/j.paid.2021.110875>.

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<https://doi.org/10.1016/j.paid.2021.110956>

Available online 24 April 2021

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