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Explosive Matters: Does Venting Anger Reduce or Increase Aggression? Differences in Anger Venting Effects in Violent Offenders

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ABSTRACT

The current study aims to investigate if venting anger reduces or increases aggression. Therefore, we allowed venting anger and measured its effect on aggression after two different anger provocation paradigms in a sample of forensic psychiatric offenders (FPO, $N = 45$) and penitentiary offenders (PO, $N = 22$). These provocation paradigms included an Articulated Thoughts in Simulated Situations (ATSS) comprising anger stories, and a harassing body opponent bag (BOB) measuring punching force. To determine aggression pre/post provocation, implicit anger and self-reported aggression was assessed. Further, the relation between provocation paradigm response, aggression, and psychopathy was evaluated. Results indicate that venting anger reduces aggression in FPO, but not in PO, where even evidence for increase in one aggression index was found. Furthermore, groups differed in immediate responses during provocation, with FPO showing significantly more verbal aggressive responses during ATSS but less physically aggressive responses during BOB than PO. Moreover, results show a correlation between automatic cognitive anger biases during provocation and psychopathy in FPO. In PO, aggressive behavioral intentions and anger control problems during provocation were both related to self-reported aggression. For clinical practice, ATSS could be utilized as a paradigm exploring the actual state of specific cognitive biases toward anger.

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Aggression can be defined as “hostile, injurious or destructive behavior” (Siever, 2008, p. 429). Often two dimensions of aggression are described, namely “cold-blooded” referring to instrumental, proactive aggression to obtain a favored outcome (like power) or to coerce others (Raine et al., 2006), and “hot-headed” referring to responsive, reactive aggression triggered by provocation (Blair, 2012).

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Both dimensions of aggression are mostly described in terms of problematic and destructive conduct (Howells & Howells, 2002). Additionally, the current study included the assessment of anger, because anger is the emotional drive behind reactive aggression (Averill, 1983; Blair, 2012). Anger is defined as an emotion “characterized by antagonism toward someone or something you feel has deliberately done you wrong” (American Psychiatric Association, APA).

Anger can be beneficial, for example, in defining personal and professional boundaries (Lown, 2007) and in motivating improvement. In fact, in the literature, anger is associated with approach motivation (Harmon-Jones, Peterson, & Harmon-Jones, 2010; He, Degnan, McDermott, Henderson, & Fox, 2010) or “the impulse to go toward” (Harmon-Jones, Harmon-Jones, & Price, 2013, p. 1). But elevated anger and the inability to regulate anger are related to problematic and destructive conduct, including aggressive and violent behavior (Blair, 2012; Howells & Howells, 2002). Consequently, anger has been defined as a mental health issue by policymakers, with anger regulation as a crucial target in the prevention of violent crime related to reactive aggression (Howells & Howells, 2002). It remains, however, elusive what exactly effective anger regulation means. According to the catharsis theory, venting emotions, specifically anger, helps reducing angry feelings and consequently aggressive behavior. The catharsis theory has been the fundament of different therapies (e.g. psychoanalysis, Freud & Brill, 1995; Scheff, 2001). The idea that venting (or expressing) anger is effective in reducing aggressive behavior has been widely supported by educators (Bennett, 1991) and the common public opinion (Gentile, 2013; Leslie, 2008), without any empirical support (Gentile, 2013).

On the contrary, some studies showed that venting anger might be ineffective and could even increase aggression (Bushman, 2002). The ineffectiveness of venting anger is in line with the excitation transfer theory (Zillmann, 1983). The excitation transfer theory (Zillmann, 1983) focuses on the link between arousal and cognitive judgment. Zillmann states that physical activity during a provocation can increase anger. More specifically, it is believed that “residual excitation enhances emotional responses to unrelated, immediately present stimuli only when the prevailing arousal cannot be attributed to its actual source” (Cantor, Zillmann, & Bryant, 1975, p. 1). The excitation transfer theory implies that individuals link arousal (residual excitation) caused by physical activity (like boxing) to the emotional state caused by the harassment (an excitation-transfer toward anger), thereby increasing anger and consequently reactive aggressive behavior (RAB).

The aim of the present study was to test if venting anger reduces or increases aggression in offenders. Given extreme anger expression in violent offender populations (Grochowska & Kossowska, 2012), and anger being a risk factor for violent recidivism (Loza & Loza-Fanous, 1999), the results of the present study investigating anger and aggression in response to provocation will contribute to the documentation of the external validity of earlier proposed anger provocation and reactive aggression paradigms.

Method

Sample

A total of 67 male, incarcerated offenders participated in the current study. The offenders were recruited from a forensic high security psychiatric hospital *Forensic Psychiatric Centre (FPC) de Rooyse Wissel* ($N = 45$) and a care unit of *Penitentiary Psychiatric Centre (PPC) Overmaze* ($N = 22$). Offenders in the forensic high security psychiatric hospital received mandatory treatment under “Ter beschikking stelling” (Tbs, placement under a hospital) order. The Tbs serves as an obligatory penal measure for mentally disordered offenders who have committed severe, usually violent, crime (Kogel & Den Hartogh, 2005). Offenders serving Tbs are incarcerated because the court perceives them as a risk to society concerning their recidivism risk without treatment (De Ruiter & Hildebrand, 2007). Offenders in the penitentiary care unit have been relocated in this unit by local penitentiaries because of unmanageable (mostly aggressive) behavior, a need for extra care, or the need of extra diagnostic information. Participants were excluded if they were <18 years, reported psychotic symptoms, had an IQ <80, or had insufficient comprehension of the Dutch language. All participants were male and ranged in age from 19 to 66 years ($M = 39.1$, $SD = 10.3$; with $M = 38.1$, $SD = 8.6$ for the forensic psychiatric offenders (FPO), and $M = 41.4$, $SD = 13.2$ for the penitentiary offenders (PO)). As to their highest level of educational attainment, 6% had attended elementary school, 80% secondary school, and 14% had attended college.

In the FPO, 4% had attended elementary school, 80% secondary school, and 16% had attended college, whereas in the PO 17% had attended elementary school and 83% secondary school. The differences in age and education between the FPO and the PO were nonsignificant (see Results). Regarding the type of offences, 81% of all offenders, with 84% of the FPO and 73% of the PO, were convicted for a violent crime (e.g. (attempted) manslaughter or murder, property crime with violence). More specific, within the FPO, 35.6% of participants had been convicted for (attempted) manslaughter or murder, 20.0% for sexual offenses such as rape, 17.8% for sexual offenses with minors, 6.7% for property crime with violence, 11.1% for bodily harm, and 8.9% for arson. Within the penitentiary group, 31.8% of participants had been convicted for (attempted) manslaughter or murder, 18.2% for sexual offenses with minors, 13.6% for property crime with violence and for bodily harm, 9.1% for property crime without violence, 4.5% for sexual offenses such as rape, for arson, and for deprivation of freedom.

Again, no significant group differences were found concerning the type of offence (see Results, section Group Differences). Psychopathy Checklist-Revised (PCL-R, Hare, 1991, 2003) data were collected only for the FPO of which the PCL-R was available ($N = 43$, 96% of the FPO). Because PCL-R data

of the PO was available for just a vast minority ($N = 4$, 18%), we included PCL-R data from the FPO only. Total PCL-R scores ranged from 10 to 36 ($M = 23.5$, $SD = 7.0$). All PCL-R interviews were scored and discussed by diagnostic forensic professionals resulting in a consensus score.

The Ethical Committee of *Maastricht University* and the Research Committee of *FPC de Rooyse Wissel* approved the methods and procedures described in the research protocol, all of which were performed in accordance with the Declaration of Helsinki. All participants contributed to this study on a voluntary basis. They received written and oral instruction emphasizing that participation was not related to treatment or prospects for release, and that participants were free to withdraw from the study at any time. After description of the study, written informed consent was obtained from each subject. Participants received financial compensation for their contribution.

Procedure

Participants first completed the Reactive-Proactive Questionnaire (RPQ, Raine et al., 2006) and the aggression indices: the Aggression Questionnaire (AQ, Buss & Perry, 1992) Anger-Single Target Implicit Association Test (Anger-STIAT, Lobbestael, Arntz, Cima, & Chakhssi, 2009) in randomized order to determine the general anger level and possible preference toward specific types of aggression (Figure 1). In order to provoke anger, the Articulated Thoughts in Simulated Situations (ATSS) paradigm (Davison, Robins, & Johnson, 1983) and the Body Opponent Bag (BOB) were used. Provocation was investigated in two identical sessions with a week in between. The order of the provocation was randomly assigned. In one session, ATSS anger stories were used as provocation, whereas in another session the RAB response to BOB with harassing feedback as provocation paradigm was used (see Measures). After each provocation, participants again completed the aggression indices (Anger-STIAT and AQ) to determine the post anger and aggression level. All test sessions were followed by a debriefing procedure in order to reduce anger (Kuin, 2000, 1996) by means of a verbal reflection on the provocation (cognitive restructuring) while walking in a neutral setting outside, until no anger is reported (Kuin, 2000, 1996).

Measures

Anger provocation paradigms

Articulated Thoughts in Simulated Situations (ATSS, Davison et al., 1983). ATSS is a cognitive assessment of thoughts and beliefs, in which subjects must react to audio recordings of certain situations as if they were in the situation themselves. In the current study, happy, neutral, and anger situations were presented. Each situation was divided into seven segments of 15–20 s. At the

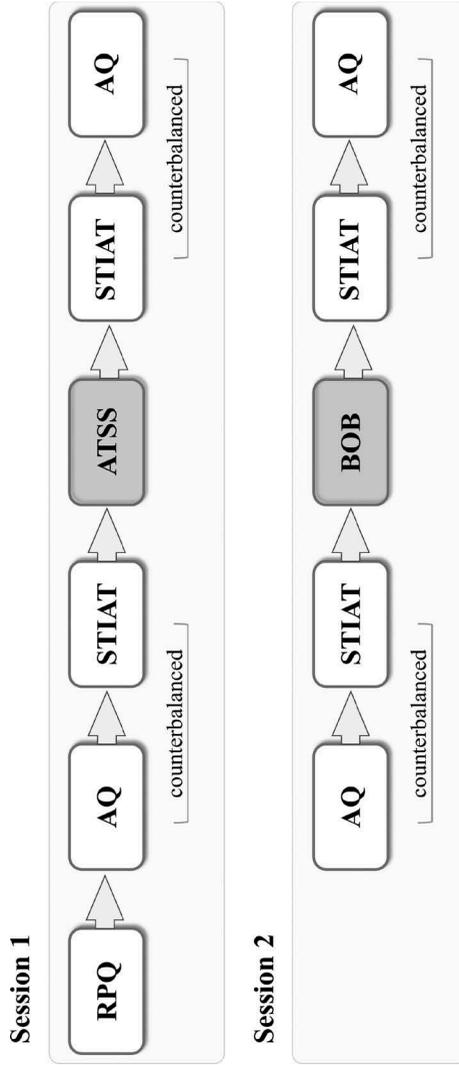


Figure 1. Procedure.

end of each segment, participants were instructed to reflect on both their thoughts and their feelings on that particular situation. Only when no response was given after 10s, response was prompted asking: (1) “What would you do, or think being in that situation?,” and (2) “How would you feel if it was you?”. All response statements were transcribed, double scored following the ATSS scoring manual (Eckhardt & Jamison, 2002) and discussed by two trained forensic professionals resulting in a consensus score. Statements were scored on six dimensions; (1) Articulated Anger Statements, covering signs of anger and other negative emotions; (2) Aggressive Behavioral Intentions reflecting the desire to harm someone/something; (3) Anger Control Strategies indicating prosocial interventions; (4) Irrational Beliefs, referring to low frustration tolerance; (5) Automatic Cognitive Biases such as dichotomous thinking; and (6) Hostile Attributions toward someone. Dimensions were scored on a 5-point scale (0 = *absent* and 4 = *extremely present*), with the exception of the hostile attributions subscale. Because only the anger stories displayed anger, we only scored the anger stories. Scores were calculated by summing the statement values within the dimension category for all anger segments. Research shows that ATSS is able to trigger anger- (Tonnaer, Siep, van Zutphen, Arntz, & Cima, 2017) and aggression-related cognitions (Barbour, Eckhardt, Davison, & Kassino, 1998; Eckhardt, Barbour, & Davison, 1998). For the current study, the anger dimension category scores were used to assess ATSS provocation (Tonnaer et al., 2017).

Body Opponent Bag with harassing feedback (BOB). BOB with harassing feedback was developed as behavioral assessment of reactive aggression in response to provocation. BOB includes an in-height adjustable full-size life-like mannequin opponent bag with a water-filled base, and weighs about 150 kg/330 lbs. Four Flexiforce (A201 type) pressure sensors with a force range of 0–445 N were constructed on Lonsdale training gloves recording the force associated with punch impact in a frequency of 1 ms (Büscher, Kõiva, Schürmann, Haschke, & Ritter, 2015). Maastricht University has developed a software program aimed to record the force of each punch in newton (N). In order to maximize the force sensitivity, mean force of all four force sensors was registered (Falco et al., 2009). Before testing, weight was registered. Participants were instructed to “punch BOB,” knowing that the beginning and end of the recording are indicated with a loud auditory start and stop signal. However, participants did not know that 15 s after start, harassing feedback was triggered by punching. Hereafter, a total of six auditory feedback fragments were triggered in set order by a punch, each starting related to a punch and minimum 7 s after last feedback: 1) “You have to do better, this is nothing!”; 2) “Can’t you hit harder? We cannot measure anything!”; 3) “Even my sister hits harder than you!”; 4) “I don’t feel anything yet!”; 5) “The other participants hit much harder than you!”; 6) “Are you

a man?”. Recording stops 15 s after the last feedback. For the current study, the mean force after the last harassing feedback from BOB corrected for the time interval (Mean Force / time interval duration) was used to assess RAB, referred to as RAB response ($M = 4.29$ N.s, $SD = 6.75$).

Implicit anger measure

Anger Single Target Implicit Association Test (Anger-Stiat, Lobbestael et al., 2009). The STIAT is a single target variant of the IAT (Greenwald, McGhee, & Schwartz, 1998). It measures the extent to which a target concept is associated with two attributes. For this Anger-STIAT, self-concept was the target category stated as “I,” with the attribute categories “anger” and “peaceful.” In the congruent condition, the target and peaceful words share the same response key, whereas in the incongruent condition the target and anger words share the same response key. Anger-STIAT effect was calculated subtracting reaction time of the incongruent from the congruent condition (Karpinski & Hilton, 2001). Participants were required to respond as quickly as possible. The current Anger-STIAT has proven its validity in earlier research on anger and the self-concept (Lobbestael et al., 2009). In the current sample, Anger-STIAT α was good to excellent (George & Mallery, 2003, .85 pre ATSS; .82 post ATSS; .85 pre BOB; .92 post BOB). Anger-STIAT pre/post-provocation was used to determine the implicit anger level.

Aggression measures

Reactive-Proactive Questionnaire (RPQ, Raine et al., 2006). The RPQ was used as a self-report of aggression during life-time consisting of 23 items, rated on a 3-point Likert scale (0 = *never* and 2 = *always*). The questionnaire includes two subscales of trait aggression: the proactive subscale, measuring proactive aggression in items such as “How often have you used force to get others so what you want?,” and the reactive subscale measuring reactive aggression in items such as “How often have you got angry or mad or hit others when teased?”. Scores of the subscales are calculated by summing the item values. Research has shown good internal reliability (Cima, Raine, Meesters, & Popma, 2013) and discriminant validity (Raine et al., 2006). In the current sample, α was excellent (RPQ Total $\alpha = .92$) and good (RPQ-R $\alpha = .85$, RPQ-P $\alpha = .89$, George & Mallery, 2003).

Aggression Questionnaire (AQ, Buss & Perry, 1992). The AQ is a self-report of 29 items, evaluated on a 5-point Likert scale (0 = *definitely disagree* and 4 = *definitely agree*). The AQ has a four-factor structure, represented in equivalent subscales denoting: (1) Physical Aggression (9 items such as “Given enough provocation, I may hit another person.”), (2) Verbal Aggression (5 items such as “I can’t help getting into arguments when people

disagree with me.”), (3) Hostility (8 items such as “I am sometimes eaten up with jealousy.”) and (4) Anger (7 items such as “Sometimes I fly off the handle for no good reason.”). The AQ has shown good test-retest reliability and construct validity (Buss & Perry, 1992). Following the George and Mallery (2003, p. 231) rule for interpreting the Cronbach’s alpha reliability, α in the current sample was good (AQ Total $\alpha = .86$ pre ATSS; AQ Total $\alpha = .88$ post ATSS; AQ Total $\alpha = .84$ pre BOB; AQ Total $\alpha = .88$ post BOB). For the current study, AQ Total score pre/post-provocation was used to assess self-reported aggression.

Data reduction and analysis

Participants scoring higher or lower than three standard deviations from the mean were considered outliers (Tush et al., 2008). If necessary, outliers were corrected by setting the maximum value in to 2 *SD* plus 1 scale point (or 2 scale points in case of 2 outliers for the more extreme). The following outliers were identified prior to the analysis: four outliers for Anger-STIAT; two outliers for the RAB response.

Independent-Samples *t*-Tests were performed in order to check for possible group differences concerning age and education. Possible group differences for the type of index offence were tested using chi-square statistics. Response differences between FPO and PO in aggression indices (pre and post self-reported aggression as well as implicit anger) were tested by means of a repeated-measures ANOVA analysis with group (FPO vs. PO) as a between-subject factor and time (pre/post) as a within-subject factor. Group differences between FPO and PO during the anger provocation were tested by means of an Independent-Samples *t*-Test on the number of cognitive anger statements during the ATSS and a Mann-Whitney U Test on mean force in RAB during BOB with harassing feedback. The relationship between the provocation paradigm responses, reactive as well as proactive aggression and psychopathy was assessed with correlational analyses.

Results

Group differences

No group differences were found concerning age ($t(67) = -1.07, p = .29$), education ($t(67) = 1.47, p = .15$), and type of offence ($t(67) = .755, p = .45$).

Pre and post aggression indices differences

ATSS. Results on the repeated-measures ANOVA with group (FPO vs. PO) as a between-subject factor and time (pre/post) indicated a significant interaction of group (FPO vs. PO) * time on self-reported aggression (AQ)

(Wilks' Lambda = .86, $F(1,64) = 10.24$, $p = .002$) signaling different reaction patterns between FPO and PO on ATSS. Repeated-measures ANOVA on the Anger STIAT did not yield any significant result.

BOB. The repeated-measures ANOVA on self-reported aggression indicated a significant interaction effect of group * time (Wilks' Lambda = .94, $F(1,64) = 4.23$, $p = .04$) signaling different reaction patterns between FPO and PO on BOB. Repeated-measures ANOVA on the Anger-STIAT showed no significant results.

Provocation paradigms differences

The anger provocation paradigm responses between FPO and PO were tested by means of an Independent-Samples *t*-Test on the number of cognitive anger statements during the ATSS and a Mann-Whitney U Test on mean force in RAB during BOB. Results showed significantly more anger response statements in the FPO while provoked by ATSS, whereas the PO showed significantly more reactive aggression response in BOB (Table 1). Group differences in ATSS total responses were due to significant differences between the groups regarding irrational beliefs (low frustration tolerance) and automatic cognitive biases (e.g., dichotomous thinking). Because of the significant group effect in the anger provocation paradigms, all following tests were performed for the groups separately.

Results for the forensic sample (FPO)

ATSS. Paired-Sample *t*-Tests of self-reported aggression (AQ, Buss & Perry, 1992) and implicit anger (Anger-STIAT, Lobbestael et al., 2009) pre/post ATSS showed a significant decrease in aggression after provocation (Table 2).

Moreover, correlational analysis between ATSS responses, reactive as well as proactive aggression (RPQ, Raine et al., 2006) and psychopathy (PCL-R, Hare, 1991, 2003), showed no significant correlation. But, a significant

Table 1. Results independent-samples *t*-tests investigating group difference in anger provocation response.

Measurement	Forensic psychiatric offenders (FPO)		Penitentiary offenders(PO)		<i>t/z</i>
	Mean	<i>SD</i>	Mean	<i>SD</i>	
ATSS total	18.46	8.39	13.64	6.67	2.35*
Anger statements	6.53	4.09	5.32	3.36	1.20
Aggressive behavior intentions	5.60	3.51	4.23	2.93	1.58
Irrational beliefs	2.90	2.62	1.32	1.99	-2.92**
Automatic cognitive biases	.28	.57	.41	.59	-1.15
Anger control	5.04	2.80	6.18	3.65	.23
BOB RAB total	1.88	3.99	9.25	8.48	-4.27**

* $p < .05$, ** $p < .01$, value based on Mann-Whitney U Test.

Table 2. Results paired-sample *t*-tests on assessment of anger and aggression pre and post the anger provocation.

Measurement	Pre		Post		<i>t</i>
	Mean	<i>SD</i>	Mean	<i>SD</i>	
Forensic psychiatric offenders (FPO)					
ATSS					
AQ Total	39.25	13.10	37.39	13.81	-2.07*
Anger-STIAT	-40.9	173.39	-7.41	180.83	1.16
BOB RAB Response					
AQ Total	39.57	13.66	37.34	14.24	-2.12*
Anger-STIAT	-48.25	155.98	-12.32	133.46	1.21
Penitentiary offenders (PO)					
ATSS					
AQ Total	49.31	19.12	52.86	18.86	2.24*
Anger-STIAT	-63.08	128.12	-48.32	158.04	.41
BOB RAB Response					
AQ Total	52.23	16.07	53.77	18.22	1.01
Anger-STIAT	-106.99	185.34	-116.29	214.56	-1.31

* $p < .05$.

correlation was found between the ATSS dimension Automatic Cognitive Biases and psychopathy (Table 3).

BOB. Paired-Sample *t*-Tests of self-reported aggression and implicit anger pre/post BOB showed again a significant decrease in aggression after provocation (Table 2).

Moreover, correlational analysis between the RAB response during BOB, reactive and proactive aggression, and psychopathy showed no significant correlations (Table 3).

Results for the penitentiary sample (PO)

ATSS. Paired-Sample *t*-Tests of self-reported aggression and implicit anger pre/post ATSS showed a significant increase in aggression after the provocation and no significant difference in implicit anger (Table 2).

Table 3. Correlations of reactive and proactive aggression, psychopathy and the provocation paradigm responses.

Measure	RPQ Reactive aggression		RPQ Proactive aggression		PCL-R Psychopathy
	FPO	PO	FPO	PO	FPO
ATSS Total	-.11	.53*	-.13	.32	-.16
Anger statements	-.06	.22	-.09	.08	-.16
Aggressive behavior intentions	-.07	.48*	.01	.33	.06
Irrational beliefs	-.11	.23	-.18	.15	-.21
Automatic cognitive biases	.09	.08	.14	-.22	.35*
Anger Control	.03	-.71**	-.01	-.59**	-.03
BOB RAB Total	-.11	-.01	-.18		-.11
				-.04	

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

Furthermore, correlational analysis between the ATSS responses, and reactive and proactive aggression showed a significant correlation between ATSS responses and RPQ reactive aggression. More specific, a significant correlation between the ATSS dimension Aggressive behavioral intentions and RPQ reactive aggression was found. Furthermore, there was a significant negative correlation between the ATSS dimension Anger control and RPQ reactive aggression, as well as RPQ proactive aggression (Table 3).

BOB. Paired-Sample *t*-Tests of self-reported aggression and implicit anger pre/post BOB showed no significant effects (Table 2).

Moreover, correlational analysis between the RAB response during BOB, reactive and proactive aggression showed no significant correlations (Table 3).

Discussion

The aim of the current study was to investigate whether venting anger reduces or increases aggression in two violent offender samples. We aimed to test the effect of venting anger on aggression in a lab-controlled manner. Therefore, we confronted all participants with two different paradigms provoking anger and allowed venting anger. These provocation paradigms included ATSS-containing anger stories and BOB with harassing feedback eliciting an RAB response. The provocation paradigm responses were analyzed measuring the number of cognitive anger statements in ATSS and mean force in RAB during BOB. Further, to determine the aggression indices, implicit anger and self-reported aggression were assessed. The relation between the provocation paradigms responses, reactive as well as proactive trait aggression (RPQ), and psychopathy (PCL-R) was assessed.

Regarding the aim of the study, the current results support the catharsis theory indicating that venting anger is effective in reducing aggression, in FPO. FPO showed a decrease in self-reported aggression propensity after both anger provocation paradigms. Although the FPO showed significantly more anger response statements compared to the PO while provoked by means of ATSS, only the PO group demonstrated an actual increase in self-reported aggression propensity after the ATSS provocation. As the ATSS is a cognitive provocation paradigm assessing thoughts and beliefs related to anger, this finding of an increase in self-reported aggression propensity only in the PO group is actually in line with the observation of very high rates of anger rumination in prison population (Bullock, 2010; Wener, 2012) that result in intensified anger, but not necessarily in less inhibitory control (Lievaart, Huijding, van der Veen, Hovens, & Franken, 2017). Regarding BOB, a more behavioral provocation paradigm assessing physical anger venting, neither increase nor decrease in anger, was found in the PO.

The finding that the FPO group showed significantly more anger response statements in ATSS, whereas the PO group showed significantly more physically reactive aggression in response to a harassing BOB, might indicate criminogenic, diagnostic, or context differences between both groups of violent offenders. Chi-square statistics testing for differences concerning the type of offence showed no significant group differences. Unfortunately, we only had access to criminogenic information concerning the PO, leaving possible diagnostic differences speculative. A majority of offenders within the PO were assigned to the special care unit because of a need for extra care, for extra diagnostic information, or because of unmanageable (mostly aggressive) behavior. As one of the assignment criteria for this penitentiary care unit is the unmanageability of aggressive behavior, it might not be surprising that the PO group is more likely to show physical aggression.

A possible implication of the sensitivity for sample type of BOB provocation paradigm is that its validity depends on population. Alternatively, it is also possible that the FPO serving a penal treatment measure because of mental problems exhibits more cognitive distortions related to mental illness, resulting in more anger statements on ATSS-containing anger stories. This was supported by the finding that the ATSS differences were mainly due to the dimension-cognitive biases. However, these group differences might also reflect a context effect like residence regime, length of stay, and level of therapeutic interventions. As to possible residence regime differences, the FPO is sanctioned for physical aggression within the clinical setting, whereas the PO group is admitted within the special care unit because of unmanageable behavior elsewhere in the penitentiary (Wesselius, 2013). Regarding the length of stay, the PO had a mean length of stay of 3–5 months (DJI, 2012), whereas the FPO has a mean length of stay of 62 months (DRW, 2012). Moreover, 82% of the FPO receives a combined verdict with penitentiary and forensic setting acceptance (Nagtegaal, van der Horst, & Schönberger, 2011). One could speculate that especially the FPO is more hospitalized and used to be “tested” on their response to provocation by daily interaction of other psychiatric patients at their ward for quite a long time. Furthermore, as to differences in the level of therapeutic interventions, FPO has a considerable history of therapy aiming to prevent violent outburst. They might, therefore, be trained to actually reflect on their feelings – resulting in more anger statements – not acting out on anger.

For the FPO, self-reported aggression showed a significant decrease after both provocations. Although very speculative, one could argue that the effects of anger venting in the FPO group supports the catharsis theory. Recent functional magnetic resonance imaging (fMRI) research on anger provocation and regulation showed regulation difficulties in violent offenders, with an increased need to regulate during anger provocation and regulation difficulties when explicitly instructed to distract (Tonnaer et al., 2017). The constant effort required for violent offenders to regulate anger might exhaust the necessary cognitive

resources, resulting in a risk for self-control failure. Therefore, venting anger in a controlled setting like for instance during psychomotor therapy could be helpful for the FPO group reducing anger feelings and aggressive behaviors, preventing cognitive exhaustion when provoked.

Results concerning the relationship between provocation, reactive as well as proactive aggression, and psychopathy showed a relationship between the ATSS dimension automatic cognitive biases toward anger and psychopathy in the FPO. Because both automatic cognitive biases toward anger and psychopathy are strongly associated with violent recidivism (Dolan & Doyle, 2000; Douglas et al., 2014), the presence of these automatic cognitive biases toward anger could be identified using ATSS in FPO, in psychopathic individuals in particular.

In the PO, a relationship between the ATSS dimension aggressive behavioral intentions and self-reported (reactive) aggression was found. Also, in line with *the general theory of crime* (Gottfredson & Hirschi, 1990), a significant negative relationship between the ATSS dimension anger control and self-reported aggression was found. Gottfredson and Hirschi (1990) propose crime as a result of lacking self-control, impulsive personality, and criminal opportunities. The current results seem to support an important role for the lack of self-control resulting in reactive aggression, specifically in the PO group. For this reason, special care to anger regulation when provoked is necessary as empirical evidence suggested that a lack of self-control is a core factor in predicting crime (Baumeister & Vohs, 2007; Vazsonyi & Belliston, 2007).

The strengths of the current study are the naturalistic anger provocation paradigms and the use of different violent offender samples. However, a number of limitations should also be acknowledged. First, as previously described we only tested men, which limits the generalizability of our results. No healthy control groups were included. We recommend that further research include non-patient as well as non-violent clinical control groups. Second, the generalizability of our study might be limited due to the context of a high security hospital. Perhaps, a less restricted setting is more suitable to provoke anger. Third, no diagnostic information was available for the PO group, leaving possible diagnostic differences speculative. Fourth, for future research, it is recommended to combine implicit as well as explicit measurements of both anger and aggression and measures assessing state aggression, sensitive for measuring change in relative small-time intervals like the Anger-STIAT is (Bluemke, Friedrich, & Zumbach, 2010; Bluemke & Friese, 2008). Fifth, we did not screen participants for suspicion regarding the true goals of the study, but we did emphasize that participation was not related to treatment, punishment, or prospects for release.

To conclude, venting anger is effective in reducing aggression, at least in the FPO. Additionally, results show group differences in provocation sensitivity

with the FPO group showing significant more anger response statements in ATSS provocation, whereas the PO showed significantly more reactive aggression behavior during BOB. Within the FPO, a relation between automatic cognitive biases toward anger and psychopathy was found. In the PO group, a relationship between aggressive behavioral intentions and self-reported (reactive) aggression was found along with a significant negative relationship between anger control and self-reported aggression.

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Disclosure statement

No potential conflict of interest was reported by the authors.

Ethical standards and informed consent

The Ethical Committee of *Maastricht University* and the Research Committee of *FPC de Rooyse Wissel* approved the methods and procedures described in the research protocol, all of which were performed in accordance with the Declaration of Helsinki.

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