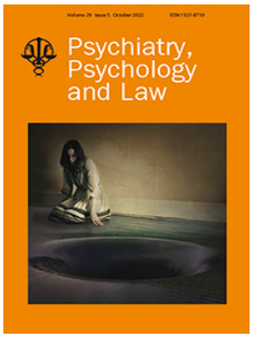

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Psychological factors predicting self-reported and observed aggression in male forensic psychiatric inpatients

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The present study examined the psychological determinants of self-reported and observed aggression in male violent forensic psychiatric inpatients. Baseline data came from 232 inpatients referred to a cognitive–behavioral treatment program. Linear regression models were used to assess the relationship between the patients' psychological characteristics and aggressive behavior. Self-reported aggression was studied with cross-sectional data, while the inpatients' observed aggression in the ward was investigated with prospective data. The main factors contributing to the prediction of self-reported aggression were state anger, antisocial lifestyle and agreeableness, while the main factors contributing to the prediction of observed aggression were trait anger and agreeableness. The findings support the focus of treatment programs for forensic psychiatric inpatients on anger management.

Key words: aggressive behavior; anger; big-five personality traits; forensic psychiatric inpatients; hostility.

Introduction

Violent forensic psychiatric patients often display aggressive behavior in the ward where they have been admitted (Greer et al., 2020). During the past decades, extensive research has been done on the individual, clinical and situational factors of aggressive behavior among forensic psychiatric inpatients (Steinert, 2002). However, research into the influence of psychological factors on this behavior is relatively scarce. At the same time, knowledge of these factors is essential for putting together effective programs that lead to a lasting reduction in aggressive behavior during their hospital stay but also after discharge when they are in an environment where aggressive behavior is often allowed or encouraged. The present study focuses on the relationship of aggression with psychological characteristics of 232 male Dutch forensic psychiatric inpatients who were obliged to participate in a cognitive–behavioral treatment program for the reduction of anger and aggression (Hornsveld & Kraaimaat, 2019).

Traits and behaviors

Relations between personality traits, for instance, the NEO Five-Factor Model (Costa & McCrae, 1992), and aggressive behavior have been studied frequently in offender and nonoffender populations. In a study by Jones et al. (2011), *neuroticism, agreeableness and conscientiousness* appeared significantly related to aggressive behavior. Extraversion and openness also manifested significant relations with aggression, but the effect sizes were small. Hornsveld et al. (2008) found that

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Dutch forensic psychiatric inpatients (all males) scored significantly higher on neuroticism and significantly lower on agreeableness than nonclinical adults. Also, the role of neuroticism and agreeableness in relational or intimate partner aggression has been demonstrated in several studies with college or undergraduate students (e.g. Hines & Saudino, 2008).

Veenstra et al. (2008) concluded from the literature that individuals prone to aggression are characterized by relatively high *trait anger,* a negatively toned emotion. They tend to perceive situations as hostile and are less capable of controlling their hostile thoughts and feelings. However, anger is neither necessary nor sufficient for aggression or violence, but it impels aggression, particularly when its intensity overrides regulatory control mechanisms. While the experience of anger creates a readiness for aggression, it may be otherwise directed, suppressed or reconstituted (Novaco, 2017). Although several theoretical explanations have been published on the relationship between anger and aggression (e.g. Wilkowski & Robinson, 2010), studies investigating such a connection are limited and are primarily performed in nonclinical populations (e.g. Bogdan et al., 2016; Zhang & Chan, 2016). Studies linking anger management treatment and reduced recidivism have indirectly demonstrated the link between anger and aggression. Many studies have demonstrated that cognitive–behavioral treatment programs that comprise, among others, anger management training resulted in lower violence recidivism (e.g. Cortoni et al., 2006; Dowden & Andrews, 2000; Joliffe & Farrington, 2007; Polaschek et al., 2004; Polaschek et al., 2016).

Hostility, the inclination to attribute negative intentions to others (Berkovitz, 1993), can also lead to anger and aggressive behavior (e.g. Matthews & Norris, 2002). For instance, Lim, Day and Casey (2011) found that violent offenders reported significantly higher trait anger levels and an increased tendency for hostile attributions than their nonviolent counterparts. Also, a meta-analytic review by Orobio de Castro et al. (2002) demonstrated a significant association between hostile attribution of intent and aggressive behavior in children. According to the integrative cognitive model (ICM) by Wilkowski and Robinson (2010), a hostile interpretation of an (alleged) conflict situation can activate trait anger, which in turn leads to state anger or reactive aggression.

Studies have addressed the relation of *psychopathy* to criminality (Blackburn & Coid, 1998), different forms of aggression (Cima & Raine, 2009; Cornell et al., 1996; Woodworth & Porter, 2002), violence in the community (Vitacco et al, 2005) and institutional aggression (Guy et al., 2005; Hildebrand et al. 2004; Hill et al., 2004). Walters (2003) studied the relation between Hare's original two *Psychopathy Checklist–Revised* (PCL–R) factors ('callous remorseless use of others' and 'chronically unstable and antisocial lifestyle'; Hare, 1991) and verbal infractions or physical aggression. The original Factor 2 appeared to have a moderately positive correlation with verbal infractions or physical aggression, whereas the original Factor 1 showed less robust associations. Guy et al. (2005) refined this analysis and found less evidence for divergent relationships between the two original PCL–R factors and various aggressive and violent behavior types. All relevant research indicates that the original Factor 2, which primarily refers to socially deviant behavior, is a good predictor of problem behaviors such as aggressive behavior and violent recidivism. Conversely, relations between the original Factor 1 and these forms of problem behavior are often modest or absent (e.g. Zwets et al., 2015).

Social anxiety was found to play a role in relational aggression (e.g. Batanova & Loukas, 2011) and forensic psychiatric outpatients' anger (Kraaimaat & Hornsveld, 2022). Also, there is evidence that a subgroup of patients with a social anxiety disorder shows

aggressive behavior (Kashdan & McKnight, 2010). Therefore, emotion regulation (discrimination of social anxiety and anger) and prosocial skills training are essential components of treatment programs aimed at reducing anger and aggression (e.g. Cortoni et al., 2006). Daffern et al. (2007) incorporated the several individual factors of aggressive behavior into *functional analysis,* a method that correlates antecedents, individual characteristics, emotional responses and consequences (Haynes & O'Brien, 2000). Hornsveld, Kraaimaat, Nunes, et al. (2019) also applied this functional analysis method, which was used to elucidate relevant individual factors such as personality traits and problem behaviors to explain reactive and proactive aggressive behavior in Dutch forensic psychiatric patients.

The present study

The two-fold aim of the present study with male forensic psychiatric inpatients was to explore the relevant psychological determinants of self-reported aggression cross-sectionally and observed aggression in the ward prospectively. We studied a relatively large sample of violent forensic psychiatric patients since there is a relative absence of studies on violent offender subjects with generalized and overlearned aggressive behavior.

Method

Participants

In the Netherlands, offenders who have committed a serious violent crime that is punishable with a maximum imprisonment of more than four years (e.g. murder, manslaughter, aggravated assault or rape) can be detained under a hospital order ('TBS order'). Based on an extensive psychiatric and/or psychological evaluation at a specialized assessment center of the Ministry of Justice and Security, it concerns offenders who are judged to have diminished responsibility for the offense they committed (Van Marle, 2000). TBS involves involuntary admission to a specialized maximum-security forensic psychiatric hospital with obligatory treatment programs that should decrease recidivism risk to an 'acceptable level for society'.

The study was performed on 232 male TBS patients at four Dutch forensic psychiatric institutions with a mean age of 33.6 years ($SD = 7.98$, range = 19–57), and 69% of the patients were from Dutch descent. The patients were classified as having an antisocial personality disorder or a psychotic disorder in remission combined with an antisocial personality disorder (*Diagnostic and Statistical Manual of Mental Disorders–Fifth Edition,* DSM–5; American Psychiatric Association, 2013). Condition of the remitted psychotic patients has been stabilized to the extent that their antisocial personality disorder was most prominent. In addition, all patients had a sufficient command of the Dutch language in speech and writing. The study was approved by the Regional Ethics Committee, CMO of Rotterdam, the Netherlands.

Setting

All patients stayed in high-security wards with a maximum of 11 and 7 patients. The patient–staff ratio was approximately 1:1.8. All patients receive general education and occupational training. Pharmacotherapy was applied to patients with a psychotic disorder and personality-disordered patients for whom it was indicated and who did not refuse medication. No specific data are available on whether and, if so, in what form individual participants received medication, since nonmedical practitioners in the participating institutions do not have access to the files of psychiatrists. Psychiatrists are part of the multidisciplinary treatment teams and in this way inform nonmedical practitioners about their medication policy of the participants.

Approximately four months after admission, the psychiatric and psychological evaluations are carried out, and an individual treatment plan is established. Four to 12 weeks after the psychiatric and psychological

evaluations and before the individual indicated therapy, the patients' aggression in the ward was assessed using observation scales.

Measures

The *Psychopathy Checklist-Revised* (PCL–R; Hare, 1991; Dutch version: Vertommenet al., 2002) was employed for measuring psychopathy. The checklist consists of 20 items, which have to be scored by certified examiners based on a file study and an interview using a 3-point scale with *does not apply* (0), *applies to some extent* (1) and *applies* (2). Vertommen et al. (2002) found support for the PCL–R's reliability and validity in the Dutch version. In addition, they confirmed Hare's two-factor structure: 'Callous and remorseless use of others' (e.g. 'Lack of remorse or guilt') and 'Chronically unstable and antisocial lifestyle' (e.g. 'Poor behavioral controls'). Also, Hildebrand et al. (2002) reported that the internal consistency of the Dutch version is high and that the interrater variability of two separate factor scores and the total score varies from good to excellent. Internal reliability coefficients Cronbach α of Factor 1 and Factor 2 obtained in the present sample was .69 and .71.

Zwets et al. (2015) studied the four-factor structure of the PCL–R (Hare, 2003) and found in a comparable sample of 411 Dutch forensic psychiatric inpatients that the internal consistency of the PCL–R total score was good with Cronbach's α coefficients of .83 for both groups of patients. For the group of patients with a personality disorder, the internal consistency of the Interpersonal, Lifestyle and Antisocial factors was acceptable (αs of .71, .71 and .70, respectively) whereas the internal consistency of the Affective factor was somewhat lower (.67). The internal consistency of the group of patients with a psychotic disorder was acceptable for the Affective and Lifestyle factors (αs of .76 and .77, respectively) and lower for the Interpersonal and Antisocial factors (αs .60 and .69, respectively). Mean inter-item correlations (MICs) were also calculated as this descriptive statistic is a true indicator of item homogeneity. The mean inter-item correlations indicated acceptable homogeneity for all factors in patients with a personality disorder (Interpersonal = .39, Affective = .34, Lifestyle = .33, Antisocial = .31) and in patients with a psychotic disorder (Interpersonal = .29, Affective = .45, Lifestyle = .40, Antisocial = .30). For the total PCL–R scale, mean inter-item correlations were acceptable for both groups (.20 for both groups) as MICs of .20 or above indicated acceptable homogeneity (Zwets et al., 2015).

The *NEO Five-Factor Inventory* (NEO-FFI; Costa & McCrae, 1992; Dutch version: Hoekstra et al., 1996) has 60 items and measures the Big Five personality domains Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness. Participants score items on a 5-point Likert scale, ranging from *entirely disagree* (1) to *entirely agree* (5). Internal consistency and test–retest reliability of the Dutch NEO-FFI scales were good in nonclinical adults' samples (Hoekstra et al., 1996). In the present study, only the domains Neuroticism, Agreeableness and Conscientiousness were used. Cronbach's α coefficients obtained in the present study are .79, .60 and .74.

The *Adapted Version of Rosenzweig's (1978) Picture-Frustration Study* (PFS–AV; Hornsveld & Kraaimaat, 2022a; Hornsveld et al., 2007a) was used to measure hostility. The PFS–AV asks participants to write down their reactions to 12 cartoon-like pictures. Respondents are instructed to examine the pictures' situation and write the first appropriate reply that enters their minds in the blank text box. Answers are scored by an experienced and independent research assistant (psychologist) on a 7-point scale, ranging from *not at all hostile* (1) to *extremely hostile* (7). In a sample of 231 forensic psychiatric patients, the internal consistency (α = .76), test–retest reliability (r = .67) and interrater reliability (r = .77) of

the PFS–AV were moderate to good. Furthermore, evidence was found for the convergent validity of the test as scores correlated with indices of agreeableness and aggressive behavior (Hornsveld et al., 2007a). Measurement invariance of the PFS–AV was found to be satisfactory and shows that the instrument is appropriate for investigating hostility across populations (Hornsveld & Kraaimaat, 2022b). In the present sample, the obtained internal reliability coefficient α was .85.

The *Inventory of Interpersonal Situations* (IIS; Kraaimaat, 2020; Van Dam-Baggen & Kraaimaat, 1990, 1999) is a Dutch self-report questionnaire with two scales. One scale indicates social discomfort/anxiety; the other scale concerns the frequency of performance of social responses (i.e. social skills). Each scale consists of the same 35 items formulated as responses to specific social situations. On the Discomfort/Anxiety scale, items are scored from *no tension* (1) to *very much tension* (5); on the Frequency scale, the identical items are scored from *I never do* (1) to *I always do* (5). The reliability and validity of the IIS have been investigated in several adult psychiatric and nonpsychiatric samples. The scales of Discomfort/Anxiety and Frequency showed stability over time. Cronbach's αs revealed a high internal consistency on both scales, while the conceptual structure was shown to be relatively invariant across socially anxious and nonsocially anxious groups. The IIS scales demonstrated high predictive validity for overt behavior in social situations (Van Dam-Baggen & Kraaimaat, 1999). Cronbach's α coefficients obtained in the present sample were .94 and .91.

The *Trait Anger subscale* of the Dutch version of Spielberger's (1980) *State–Trait Anger Scale* (ZAV; Van der Ploeg et al., 1982) was used to measure the general disposition to anger. Participants rate each item how they generally feel using a 4-point Likert scale: *almost never* (1), *sometimes* (2), *often* (3) and *almost always* (4). In a group of 150 Dutch male university students, Van der Ploeg et al. (1982) found that the trait anger scales' internal consistency (α coefficient) was .78, and test–retest reliability of .78 was documented in a subgroup of 70 students. The convergent validity of the trait anger scale also proved to be satisfactory. The present sample obtained an internal Cronbach α coefficient of .92.

The *NAS Part A of the Novaco Anger Scale–Provocation Inventory* (NAS–PI; Novaco, 2003; Dutch version: Hornsveld et al., 2011) was used to measure state anger and concerned the self-reported responses relating to cognitive, arousal and behavioral components of anger in 48 anger-eliciting situations. The items are scored on a 3-point Likert-type scale: *never true* (1), *sometimes true* (2) and *always true* (3). In a sample of 194 Dutch violent forensic psychiatric outpatients (all males), for the NAS total score the internal consistency (Cronbach's α) was found to be .95, and the test–retest reliability in a subgroup of 90 outpatients was .80 (Hornsveld et al. 2011). The internal reliability coefficient α obtained in the present study was .94.

The *Aggression Questionnaire* is derived from Buss and Perry's Aggression Questionnaire with 29 items (AQ; Buss & Perry, 1992; Dutch version: Meesters et al., 1996), which spread among four subscales, namely Physical Aggression, Verbal Aggression, Anger and Hostility. Respondents answer the items using a 5-point scale ranging from *not at all like me* (1) to *completely like me* (5). In a group of 138 Dutch TBS patients (all males), Hornsveld et al. (2009) found for the AQ total an internal consistency (Cronbach's α) of .83 and for the four subscales an internal consistency of .72 .34, .57 and .81 successively. Only Physical Aggression and Verbal Aggression subscales were used in the present study. The scores on these two subscales were added together. The correlation between both scales was .61. The internal coefficient α of the combined scale in the present study was .82.

The *Observation Scale for Aggressive Behavior* (OSAB; Hornsveld et al, 2007b) measures behavior in the ward. The scale comprises 40 items spread over the subscales Irritation/Anger, Anxiety/Gloominess, Aggressive Behavior, Social Behavior, Antecedent and Sanction. The staff scores the behavior of inpatients in the preceding week on a 4-point scale with *no* (1), *seldom* (2), *occasionally* (3) and *frequently* (4). The psychometric qualities of the OSAB were studied in a sample of 220 Dutch violent forensic psychiatric inpatients. Results showed that the internal consistency of the subscales varied from .63 to .93, and interrater reliability correlations were between .49 and .81, whereas test–retest reliability ranged between .48 and .79 (Hornsveld et al., 2007b). In the present study, only the 10-item subscale Aggressive Behavior was used. The internal consistency α of this subscale obtained in the present study was .79.

Procedure

The questionnaires, in paper-and-pencil format, were taken individually from the patients. Then, after 4–12 weeks, before the patients started with their cognitive–behavioral treatment program for their aggression, the staff members completed the observation scale (OSAB).

Statistics

Data were analyzed using IBM SPSS (Statistical Package for the Social Sciences) Version 25 and AMOS 26. Descriptive statistics were used to examine the scores on the questionnaires and scales. Two-tailed significance testing and α levels of .05 and .01 were used for all analyses. First, Pearson correlation coefficients were calculated to examine the relationship between all variables in the study. Next, linear regression analyses were calculated with those independent variables significantly associated with the dependent variables. A linear regression analysis (forward procedure[1]) was performed with age, PCL–R Factor 2 antisocial lifestyle, the NEO-FFI personality domains Neuroticism and Agreeableness, state anger (NAS–PI) and trait anger (STAS) as independent variables and self-reported aggression (AQ) as the dependent variable. In addition, a linear regression analysis (forward procedure) was performed with the NEO-FFI personality domains Neuroticism and Agreeableness, state anger (NAS–PI), trait anger (STAS) and self-reported aggression (AQ) as independent variables and observed aggression (OSAB) as the dependent variable. Multicollinearity was measured by tolerance (Allison, 2003). Finally, to explore the indirect effects of the predicting variables, indices of mediation for all obtained regression models were calculated using AMOS 26 (Preacher & Hayes, 2008).

Results

Distributions of all variables were investigated and considered normal as skewness and kurtosis were within |3| (Tabachnick & Fiddell, 2007). In Table 1, the mean, standard deviation and the number of participants are presented for the measurements obtained from the participants. As shown in Table 1, the internal consistency coefficients of the measurements used indicated a modest (Agreeableness, PCL–R factors) to good and excellent internal reliability. Concerning the OSAB, no incidence of aggression was observed in 13% of the patients (scores <11) during the one week of observation. Due to missing values, the SPSS pairwise procedure was used to calculate Pearson correlation coefficients and perform regression analyses with the dataset of 232 inpatients.

In Table 2, correlation coefficients are presented between all variables. State anger (NAS–PI), trait anger (STAS), antisocial lifestyle (PCL–R Factor 2) and neuroticism

[1]The forward procedure means that variables are entered consecutively according to the extent of their correlation.

Table 1. Characteristics of participants.

Measure	Domains/factors/scales	*M*	*SD*	*N*	Cronbach's α
Neo-FFI	Neuroticism	33.50	8.06	184	.83
	Agreeableness	41.21	4.95	184	.60
	Conscientiousness	45.10	5.44	184	.73
PFS–AV	Hostility	29.03	10.39	162	.85
STAS	Trait anger	19.04	7.90	170	.92
PCL–R	Callousness	9.23	3.75	195	.69
	Antisocial lifestyle	10.64	3.97	194	.71
IIS	Social anxiety	64.43	21.77	173	.94
	Social skills	118.62	19.40	174	.91
NAS–PI	State anger	83.11	13.63	162	.94
AQ	Physical + verbal aggression	39.55	8.55	175	.82
OSAB	Aggression on the ward	15.99	5.48	157	.79

Note: NEO-FFI = Five Factor Inventory; PFS–AV = Adapted Version of the Picture-Frustration Study; STAS = State–Trait Anger Scale; PCL–R = Psychopathy Checklist–Revised; IIS = Inventory of Interpersonal Situations; NAS–PI = Novaco Anger Scale–Provocation Inventory (1994 version); AQ = Aggression Questionnaire; OSAB = Observation Scale of Aggressive Behavior.

(NEO-FFI) appeared to be positive, and age and agreeableness (NEO-FFI) were negatively related to self-reported aggression (AQ). In addition, trait anger (STAS), state anger (NAS–PI), self-reported aggression (AQ) and neuroticism (NEO-FFI) were positively related and agreeableness (NEO-FFI) negatively related to observed aggression (OSAB).

Predictors of self-reported aggression (AQ)

A linear regression analysis (forward method) was performed with the AQ scale as the dependent variable. Only those independent variables significantly related to the dependent variable were introduced. A summary of the results is presented in Table 3.

The analysis resulted in three models explaining 32–39% of the variance of self-reported aggression. Predictors in the last model were state anger (NAS–PI) followed by antisocial lifestyle (PCL–R Factor 2) and agreeableness (NEO-FFI). The explained variance of 39% and Cohen's (1988) $f^2 = .65$ are indicative of a large effect. As can be seen, by the standard coefficient *B*, relatively high scores for state anger and antisocial lifestyle and a low score of agreeableness were associated with high scores of self-reported aggression.

There was no evidence of collinearity because tolerance values (.87, .99 and .87) were all above .20 (Martin & Bridsmon, 2012). Exploration of mediated effects on self-reported aggression using AMOS 26 revealed insignificant indices of mediation (Preacher & Hayes, 2008) for antisocial lifestyle (standardized indirect effect = .00) and agreeableness (standardized indirect effect = .00).

Predictors of observed aggression (OSAB)

A linear regression analysis (forward method) was performed with the OSAB scale as the dependent variable. Only those independent variables significantly related to the dependent variable were introduced. A summary of the results is presented in Table 4.

The analysis resulted, respectively, in two models explaining nine to about 13% of the variance of observed aggression. Predictors of the last model were trait anger (STAS) and agreeableness (NEO-FFI). The explained variance of about 13% and Cohen's (1988) $f^2 = .15$ indicate a medium effect. As can be seen, by the standard coefficient *B*, a relatively high trait anger score and a low agreeableness score

Table 2. Correlations between the psychological factors, self-reported and observed aggression, and age.

		NEO-FFI			PFS–AV	STAS	PCL–R		IIS		NAS–PI	AQ	OSAB
Measures	Domains/ factors/scales	Neuroticism	Agreeableness	Conscientiousness	Hostility	Trait anger	Callousness	Antisocial lifestyle	Social anxiety	Social skills	State anger	Physical + Verbal aggression	Aggression on the ward
NEO-FFI	Neuroticism	—											
	Agreeableness	−.15*	—										
	Conscientiousness	−.28**	.24**	—									
PFS–AV	Hostility	−.04	−.28**	−.09	—								
STAS	Trait anger	−.27**	−.32**	−.17*	.08	—							
PCL–R	Callousness	−.27**	.01	.16*	−.08	−.12	—						
	Antisocial lifestyle	−.13	−.09	−.10	.02	.21*	.46**	—					
IIS	Social anxiety	.52**	−.05	−.25**	.11	.15	−.17*	−.21**	—				
	Social skills	−.34**	.08	.30**	−.10	−.08	.19*	.19*	−.47**	—			
NAS–PI	State anger	.52**	−.35**	−.20*	.24**	.45**	−.15	.09	.35**	−.16*	—		
AQ	Physical + Verbal aggression	.19*	−.38**	−.09	.16	.44**	−.13	.28**	.01	.02	.56**	—	
OSAB	Aggression on the ward	.19**	−.30**	−.11	.01	.32**	.06	.14	−.09	−.07	.20**	.20**	—
	Age	.02	.17*	−.01	−.20**	−.05	.07	−.04	.11	.02	.02	−.22**	.006

Note: NEO-FFI = Five Factor Inventory; PFS–AV = Adapted Version of the Picture-Frustration Study; STAS = State–Trait Anger Scale; PCL–R = Psychopathy Checklist–Revised; IIS = Inventory of Interpersonal Situations; NAS–PI = Novaco Anger Scale–Provocation Inventory (1994 version); AQ = Aggression Questionnaire; OSAB = Observation Scale of Aggressive Behavior.
*$p < .05$. **$p < .01$.

Table 3. Regression analysis results: predicting self-reported aggression (AQ).

Measures	Domains/Factors/ Scales	β	Standard error	Standardized B	R^2 adjusted	R^2 change
Model 1					.317**	.322**
NAS–PI	State anger	.356	.045	.568**		
Model 2					.366**	.054**
NAS–PI	State anger	.344	.044	.547**		
PCL–R	Antisocial life style	.501	.150	.232**		
Model 3					.393**	.030**
NAS–PI	State anger	.303	.046	.482**		
PCL–R	Antisocial life style	.479	.147	.222**		
NEO-FFI	Agreeableness	−.323	.126	−.187**		

Note: NAS–PI = Novaco Anger Scale–Provocation Inventory (1994 version); PCL–R = Psychopathy Checklist–Revised; NEO-FFI = Five Factor Inventory; AQ = Aggression Questionnaire.
**$p < .01$.

Table 4. Regression analysis results: predicting observed aggression (OSAB).

Measures	Domains/factors/ scales	B	Standard error	Standardized B	R^2 adjusted	R^2 change
Model 1					.094**	.101**
STAS	Trait anger	.221	.060	.318**		
Model 2					.129**	.042*
STAS	Trait anger	.173	.062	.249**		
NEO-FFI	Agreeableness	−.240	.099	−.217*		

Note: NEO-FFI = Five Factor Inventory; STAS = State–Trait Anger Scale; OSAB = Observation Scale of Aggressive Behavior.
*$p < .05$. **$p < .01$.

were associated with high scores of observed aggression. No evidence was revealed of collinearity because tolerance values (.90 and .90) were all above .20 (Martin & Bridsmon, 2012). Exploration of a mediated effect on observed aggression using AMOS 26 revealed an insignificant index of mediation (Preacher & Hayes, 2008) for agreeableness (standardized indirect effect = .00). Potentially aggression of forensic psychiatric patients at the ward seems to be driven by the individual factors of enduring anger and low sociability.

Discussion

The psychological factors of trait and state anger, agreeableness, neuroticism and antisocial lifestyle were significantly associated with the aggressive behavior of forensic psychiatric inpatients. Specifically, high scores on state anger and antisocial lifestyle and low scores on agreeableness were the main predicting variables for self-reported aggression. High scores on trait anger and low scores on agreeableness were the prospective and main predictors of observed aggression. These individual factors explained 39% of the variance of self-reported and 13% of the variance of observed aggression in the ward. It must be noted that other factors, specific environmental factors, might be at stake concerning observed aggression at the ward. For instance, Daffern et al. (2007) found that the most common function of inpatient aggression was a

response to the restrictions and demands of the inpatient setting and provocative actions by co-patients.

Self-reported aggression and observed aggression were significantly associated but to a relatively low degree. The latter finding may be due to various factors such as the use of different measurement methods, in this case, self-reporting versus observation by staff, a cross-sectional versus a prospective design, and different periods and situations such as one week of observed behavior at the ward and patients' retrospective assessment of aggression in a wide range of past and present situations. The ward's anger-inducing situations will also be quite different and more restricted from those previously experienced by the patients. A forensic hospital is a highly structured, restricted and controlled environment where aggressive behavior is not tolerated and inhibited (e.g. Van Marle, 2000). Outside the hospital, the patients probably lived in an environment where aggressive behavior is more permitted and sometimes even instrumental and strategic. Therefore, the results obtained with the OSAB and the AQ may indicate somewhat different realms that are both informative of the forensic inpatients' aggression.

Neuroticism

Neuroticism was low but significantly related to self-reported as well as observed aggression. The personality trait of neuroticism indicates a person's susceptibility to disturbed emotional regulation, as demonstrated by heightened emotional states such as fear, anxiety and aggression (Barlow et al., 2014; Ormel et al., 2013). As such, neuroticism can be regarded as a higher order construct of specific negative emotions. Due to a disrupted emotion regulation process, forensic psychiatric patients with a high score of neuroticism and trait anger may be inclined to respond in conflict situations with negative emotions such as state anger, resulting in aggression.

Since no instrumental goal was present or assumed in the observed aggressive behavior on the ward, there is no reason to consider the measured aggressive behavior as proactive (Bettencourt et al., 2006). In addition, anger was significantly related to self-reported and observed aggression, which is indicative of reactive aggressive behavior. When patients are observed to be angry, it may indicate that their aggressive behavior is not instrumental (Daffern et al., 2007). Notwithstanding this, both reactive and proactive components may be involved in self-reported aggression as measured by the combined AQ subscales.

Social anxiety

Social anxiety and lack of adequate social skills turned out not to be associated with aggression. This contrasts with our clinical observations that forensic psychiatric patients often respond more clumsily during role-plays than they indicate in interviews and on self-report measures. An explanation may be that they confuse assertive with aggressive responding. Some support for this assumption was found in an earlier study (Hornsveld et al., 2008) where forensic psychiatric inpatients reported, compared with a norm group, significantly lower social anxiety and more social skills in situations where criticism is given, and higher social anxiety and fewer skills where another person is complimented. Further research with regard to this issue is warranted.

Hostility was negatively associated with agreeableness and positively with state anger but not associated with self-reported and observed aggression. In line with this, Lim et al. (2011) found higher trait levels and an increased tendency for hostile attributions in violent offenders compared to nonviolent counterparts. This suggests that the role of hostile attributions is more or less restricted to eliciting and enhancing the forensic psychiatric patients' anger. It seems that hostility and anger might reciprocally activate each other.

Limitations

The present investigation has several limitations. First, the results show that trait and state anger are the main predictors of what appears to be primarily reactive aggression. In future studies, a specially designed instrument for self-reported proactive aggression may be used, for example, the Reactive Proactive Questionnaire (RPQ; Raine et al., 2006). Second, though self-report is a primary source for assessing the patient's thoughts, emotions and action tendencies, it has several limitations. Even though the scores on the self-report questionnaires showed a consistent picture, we should keep in mind that forensic psychiatric patients' responses may be influenced by their desire to make a positive impression and limited insight into their behavior (Hornsveld, Kraaimaat, Nijman, et al., 2019). Third, the correlations of agreeableness with related constructs support the construct validity of this measure. However, the low internal reliability ($\alpha = .60$) warrants further investigation of underlying facets of this broad domain and their correlations with the measures of anger and aggression used in the present study.

Our impression is that the primarily low-educated patients did not know the meaning of some words and only asked for clarification when administered in a few cases. Last, as only male patients were enrolled in the study, it is unknown to what extent the findings generalize to female forensic psychiatric patients. Primarily, females are known to use more covert and indirect social and verbal forms of aggression (Björkvist, 2018).

Further research and consequences for treatment

As the determinants examined in this study are rather general, further research on the population of violent forensic psychiatric patients is needed into the specific processes involved in emotion dysregulation, such as attention, perception and information processing (e.g. Andrews & Bonta, 2010; Wilkowski & Robinson, 2010).

In conclusion, forensic psychiatric inpatients' aggression was associated with the dynamic and psychological factors of trait and state anger, agreeableness, neuroticism and antisocial lifestyle. Furthermore, high anger and low agreeableness were efficient in predicting high self-reported and observed aggression levels. Our results support using therapy modules aimed at anger management, prosocial attitudes and prosocial skills in forensic psychiatric patients (e.g. Goldstein et al., 1998; Hornsveld & Kraaimaat, 2019).

Ethical standards

Declaration of conflicts of interest

Ruud H.J. Hornsveld has declared no conflicts of interest

Floris W. Kraaimaat has declared no conflicts of interest

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the Regional Ethics Committee, CMO of Rotterdam, the Netherlands, and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study

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