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ORIGINAL ARTICLE

Examining the Role of Static and Dynamic Risk Factors in the Prediction of Inpatient Violence: Variable- and Person-Focused Analyses

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Abstract Although the construct of psychopathy is related to community violence and recidivism in various populations, empirical evidence suggests that its association with institutional aggression is weak at best. The current study examined, via both variable-level and group-level analyses, the relationship between standard violence risk instruments, which included a measure of psychopathy, and institutional violence. Additionally, the incremental validity of dynamic risk factors also was examined. The results suggest that PCL-R was only weakly related to institutional aggression and only then when the behavioral (Factor 2) aspects of the construct were examined. The clinical and risk management scales on the HCR-20, impulsivity, anger, and psychiatric symptoms all were useful in identifying patients at risk for exhibiting institutional aggression. These data suggest that factors other than psychopathy, including dynamic risk factors, may be most useful in identifying forensic patients at higher risk for exhibiting aggression.

Keywords Psychopathy · Institutional aggression · Dynamic risk factors · Anger

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The prediction of violent behavior has long been considered one of the primary tasks in forensic psychiatry and psychology. Determining who is going to be violent and under what circumstances is paramount in many decisions associated with this field of clinical practice (Lyon et al. 2001; Shah 1978). Although research through the early 1980s suggested that psychiatrists and psychologists had a relatively poor accuracy rate in the identification of who will be violent (Monahan 1981), recent risk assessment methods have improved the accuracy of these predictions. For example, several risk instruments, such as the HCR-20 (Webster et al. 1997), the Violence Risk Appraisal Guide (VRAG; Quinsey et al. 2006), and the Classification of Violence Risk (COVR; Banks et al. 2004) have demonstrated effect sizes primarily in the modest to moderate range in the prediction of community violence among civil and forensic psychiatric patients, as well as criminal offenders (e.g., Douglas et al. 2006b; Edens et al. 2006; Glover et al. 2002; Grann et al. 2000; Kroner and Mills 2001; Monahan et al. 2005; for overviews, see Edens and Otto 2001; Quinsey et al. 2006; Walters 2006).

In addition to more elaborate assessment instruments that tap several risk domains, one individual risk factor, psychopathy, has been extensively researched and shown to be meaningfully related to violent conduct across various settings (Douglas et al. 2006a; Gendreau et al. 2002; Hemphill et al. 1998; Salekin et al. 1996). The Psychopathy Checklist (PCL; Hare 1980) and its revised version (PCL-R; Hare 2003) were developed not as violence risk assessment devices but as instruments to quantify the construct of psychopathy. Hervey Cleckley's (1941) seminal conceptualization of a psychopath—the smooth-talking superficially glib charmer—was combined with the presumed behavioral sequela of such an affective deficit to produce the items on the PCL. Despite not being

a risk instrument per se, substantial research has been conducted since its development suggesting that the PCL-R is associated with post-release community violence (Douglas et al. 2006a; Monahan et al. 2001) as well as recidivism (Harris et al. 1991; Hemphill et al. 1998; Gendreau et al. 2002; Salekin et al. 1996). Some of this research even has suggested that psychopathy in isolation may predict these outcomes as well as or better than the more elaborate risk instruments noted earlier (Cooke et al. 2001; Edens et al. 2006; Kroner and Mills 2001; Tengstrom 2001; cf. Glover et al. 2002). In fact, the strength of the relationship between the PCL-R and violence has led some authors to suggest that *not* using the PCL-R in violence risk assessments may be tantamount to professional misconduct (Hart 1998; cf. DeMatteo and Edens 2006; Edens et al. 2001; Gendreau et al. 2002).

Although the primary prediction issue with forensic patients is determining when they may be safely released into the community, also of considerable importance is identifying those patients who may evidence aggression during their period of hospitalization. This is particularly relevant in forensic facilities, where many patients are involuntarily committed for violent felonies. Aggression and violence are common in general inpatient psychiatric settings. For example, Silver and Yudofsky (1987) recorded over 3,000 episodes of aggressive behavior (including verbal and physical) in 30 psychiatric inpatients during a 20-month period. Recent research has indicated that a variety of factors are associated with institutional aggression, although it remains unclear if factors associated with aggression in the community are as useful in identifying those patients (both civil and forensic) who may exhibit increased aggression while hospitalized. One recent study indicated that involuntary status, female gender and substance use diagnoses predicted physical aggression against others (Serper et al. 2005). In a sample of male mentally ill offenders, anger, antisocial personality style and impulsivity were strong predictors of institutional aggression (Wang and Diamond 1999).

Early research on the PCL measures suggested that they were strong predictors of violence in institutions (e.g., Hare and McPherson 1984; Hill et al. 1996). Despite the generally positive association between the PCL-R and violence, however, the more recent literature has been inconsistent regarding the relationship between psychopathy and institutional aggression specifically. For example, in a meta-analysis, Walters (2003) reported that the Factor 1 scores of the PCL-R (comprised of the characterologic aspects of a psychopath, e.g., glib, charming, remorseless) were only weakly associated with institutional misconduct, with a slightly increased association when the Factor 2 scores (comprised of behavioral aspects of a psychopath, e.g., impulsive, poor behavioral controls, juvenile delinquency) were examined. In a more comprehensive meta-analysis, Guy et al. (2005) reported that the largest associations between the PCL and institutional misbehavior were for general misconduct. The smallest effect size (weighted $r = .17$) was associated with physical violence. Similarly modest results were found when examining the factor scores. Weighted mean effect sizes also were quite heterogeneous, indicating that the variability in effect sizes across studies was beyond what could be explained simply by chance.[1] Of note, nationality explained the variability in these effects to some extent, with results from U.S. institutions being much weaker (weighted $r = .13$) than studies from Canadian and European settings (weighted $r = .21$).

Aside from concerns regarding the utility of psychopathy in identifying dangerous patients, concerns also have been noted regarding the predictive validity of instruments such as the VRAG and the HCR-20 in relation to institutional violence (Edens et al. 2005). Compared to the community violence literature, relatively few studies have examined the predictive utility of these measures for identifying violence-prone individuals in in-patient settings. Studies to date (e.g., Belfrage et al. 2000; Dernevik et al. 2002; Doyle et al. 2002) offer some preliminary support for the utility of these measures, although various questions remain, such as the extent to which they demonstrate any incremental validity (Hunsley 2003; Sechrest 1963) in relation to each other (Kroner et al. 2005) or beyond factors such as psychopathy in isolation (Cooke et al. 2001; Kroner and Mills 2001). Additionally, almost all of the extant institutional research has been conducted in Europe and Canada rather than in the U.S.

The primary purpose of forensic facilities in treating mentally ill offenders is providing interventions aimed at the reduction of violence risk. Unfortunately, with few exceptions, most risk assessment instruments utilize historical information or static conditions that are invariant and unchanging. For example, in the VRAG, age at index offense (younger) and elementary school maladjustment (to name two) increase the individual's score on this tool. Additionally, the scoring of the VRAG includes the PCL-R, which typically is construed as an immutable characterological construct and as such theoretically unchanging–although there is actually scant empirical research on the temporal stability of psychopathy across the life span (Edens 2006).[2]. As Hart (1998) cogently noted, the goal of

[1] Of note, although mean effect sizes have been somewhat higher in the community violence literature, significant heterogeneity has been reported in these meta-analyses as well (Gendreau et al. 2003; Walters 2003), suggesting this problem is not specific to the relationship between PCL-R scores and institutional violence.

[2] There is also considerable controversy surrounding the amenability of psychopathy to treatment (Caldwell et al. 2006; D'Silva et al. 2004), but this controversy centers more so on the behavioral sequelae of psychopathy, not the characteristics themselves

risk assessment ultimately is prevention of violence. Thus, assessment methods must include factors that are amenable to intervention (Douglas and Skeem 2005). As outlined by Douglas and Skeem, such factors must possess three components: (1) the factor has been shown to precede and increase the likelihood of violence, (2) the factor can be altered either spontaneously or through intervention, and (3) alterations in the factor change the likelihood of violence. The authors proposed various dynamic risk factors for further investigation, including impulsivity, anger and substance use.[3] The extant literature offers considerable support for the contention that anger and hostility are risk factors for interpersonal aggression. For example, research has shown positive associations between anger scales and institutional misconduct among violent male offenders in prison (Mills and Kroner 2003; see also Mills et al. 1998). Similarly, evidence also supports the hypothesis that impulsivity should be associated with a greater likelihood of acting out in controlled environments (Fehon et al. 2005; Wang and Diamond 1999; see, more generally, Barratt 1994). Less extensively studied, however, is the extent to which these self-report measures improve predictive validity beyond the more comprehensive risk factors, such as the HCR-20 or VRAG. As such, in the current study, we will examine the extent to which these variables add to the prediction of institutional misbehavior beyond the risk instruments described above.

As psychiatric institutions move towards more data-based methods of treatment (e.g., Texas Medication Algorithm Project [TMAP]; Clinical Antipsychotic Trials of Intervention Effectiveness [CATIE]), facilities are exploring methods for identifying and treating individuals at higher risk of committing institutional infractions. Recent research has indicated that developing a typology of aggressive incidents may provide insight both into precipitants to assaults as well as appropriate interventions to reduce such aggression. In a recent study at a state (civil) psychiatric facility, three primary motivations for assault were identified: disordered impulse control, psychopathic (i.e., a planned assault committed for a specific purpose) and psychotically motivated assaults (Nolan et al. 2003). These results indicate that in addition to suggesting specific interventions tailored to the type of assault, patients may exhibit varying profiles of symptoms or character structure that may be associated with each type of assault. As such, categorizing characteristics of patients may be as useful as categorizing types of assaults. Therefore, aside from examining the basic and incremental validity of the variables described above, in this study we also sought to identify, via cluster analysis, subtypes of patients who might be predisposed to violent behavior in institutional settings, using both static and dynamic risk factors as clustering variables.

[3] One exception to the static concerns in risk assessment is the HCR-20, developed not as an instrument per se but rather as a guide for clinicians in considering those factors empirically related to violence risk. As such, this guide incorporates items in the ''C'' scale considered to be amenable to intervention, such as active symptoms of major mental illness and impulsivity.

Method

Participants

This research was approved by the Human Subjects Committee at Napa State Hospital (NSH), the state (of California) Committee for the Protection of Human Subjects and the University of California-Davis (UCD) School of Medicine Institutional Review Board. Additionally, a Certificate of Confidentiality was obtained from the National Institute of Mental Health, preventing research documents from being subpoenaed. The Deputy Director of Long-term Care in the California Department of Mental Health and the Executive Director of NSH agreed not to mandate release of research records for any purpose.

This study was conducted at NSH, a 1,200-bed long-term care psychiatric hospital in Napa, California. Approximately 80% of the patients hospitalized at NSH are under a forensic commitment. These commitments include Incompetent to Stand Trial (IST), Not Guilty by Reason of Insanity (NGRI), Mentally Disordered Offender (MDO), and a small number of various other commitment types. In California, Mentally Disordered Offenders are a statutorily defined category of individuals incarcerated in penal institutions who are deemed too dangerous for release secondary to their mental illness and are subsequently transferred to the state mental health system.

In the past several years, NSH has contracted with UCD to institute a collaborative research effort. As part of this collaboration, UCD operates a Clinical Demonstration and Research Unit (CDRU) at NSH. Only patients who are post-trial (i.e., NGRI and MDO rather than IST) presently participate in this research effort.

A total of 154 patients participated in the study between July, 2002 and September 2005. Of those, 108 had completed all required assessments. The overall sample was predominantly male (84%) and Caucasian (72%). The modal commitment offense was assault and/or battery (39%), followed by murder/manslaughter (24%). Most participants were committed under the NGRI statute. Most participants were diagnosed with either schizophrenia (53%) or schizoaffective disorder (19%), with the remainder diagnosed with mood disorders, substance use disorders or other disorders. Other disorders included, for example, pedophilia, psychotic disorder NOS and mental disorder NOS. The average age of the participants was

Table 1 Demographic and clinical characteristics of the sample

	n (%)
Race	
African-American	24(22)
Caucasian	70(65)
Other	14(13)
Gender	
Male	91(84)
Female	17(16)
Instant offense	
Murder/manslaughter	26(24)
Assault/battery	42(39)
Sex offense	16(15)
Theft	12(11)
Arson	6(6)
Miscellaneous	5(5)
Legal class	
NGRI	89(82)
MDO	19(18)
Axis I diagnosis	
Schizophrenia	57(53)
Schizoaffective disorder	21(19)
Substance use disorders	4(4)
Mood disorders	10(9)
Other disorders	16(15)
Axis II diagnosis	
Antisocial PD	24(71)
Borderline PD	4(12)
Other PD	6(18)

45.6 years, with an average length of stay of 5.9 years. Table 1 provides the complete demographic and clinical information for this sample.

Measures

Diagnostic Assessments

Diagnostic assessments initially were performed using the Structured Clinical Interview for DSM-IV (SCID; First et al. 1995) and the Structured Interview for DSM-IV Personality Disorders (SIDP-IV; Pfohl et al. 1997), both of which were administered by research assistants. The senior psychologists participating in the research effort thoroughly reviewed the record to confirm the diagnoses arrived at by the structured interviews. Upon examining the relationship between the SCID diagnoses and the chart diagnoses, non-agreement was found in only 22% of the cases (8 of 37). In the majority of these cases, the diagnosis was changed from Schizoaffective Disorder to Schizophrenia (14% or 5 of the 8 diagnosis changes). Since the SCID diagnoses were confirmed by record review and because diagnosis is a less potent predictor of aggression in psychiatric patients (Monahan et al. 2001), this procedure was replaced in June of 2003 with a chart diagnosis confirmation using the DSM checklist. The senior author and a research psychologist performed this confirmation. When disagreements between the reviewer and the chart were found, a second psychologist was asked to review the record for the final diagnosis. Of the 108 participants, a total of 58 diagnoses were made with the SCID procedure, with the remaining 50 with the chart confirmation procedure.

Symptom Ratings

The Brief Psychiatric Rating Scale (BPRS; Overall and Gorham 1962) was used to quantify psychiatric symptoms. The BPRS consists of 18 items rating psychiatric symptoms (e.g., anxiety, depression, hallucinations). It is a widely used assessment that includes affective symptoms as well as psychotic symptoms. This instrument has been used extensively in psychiatric research to document change in symptoms over time. Initially, the treating psychiatrist performed the symptom ratings (on the CDRU patients) after receiving training in the administration of the BPRS. Training was conducted by a senior research psychologist and a senior research analyst, both of whom have trained research assistants in the conduct of these instruments. Training was conducted until the squared sum of the differences between raters and the trainer was 35 or less for the entire 18-item scale. Routine recalibrations were performed every 6 months to ensure consistency of scoring. As the study expanded to the open units, all symptom ratings were conducted by research assistants similarly trained in the administration of the BPRS. As with the psychiatrists, routine re-calibrations are conducted regularly. The intraclass correlation coefficient for all raters was .92

Violence Risk Assessments

Three widely used instruments were employed as violence risk assessments: the PCL-R (Hare 2003), the VRAG (Quinsey et al. 1998) and the HCR-20 (Webster et al. 1997).

The PCL-R includes 20 items measuring varying traits associated with psychopathy. Representative items include glibness, superficial charm, pathological lying, lack of remorse or guilt, parasitic lifestyle, impulsivity, and irresponsibility. Individuals are rated from 0 (not present) to 2 (definitely present) on the 20 items. Scores from the checklist range from 0 (absence of psychopathic traits and behavior) to 40 (severe psychopathic traits and behavior).

A score of 30 and above is generally accepted as indicating a psychopathic personality. Factor analyses have indicated that the psychopathy checklist can be divided into two factors (Hare 1991; Harpur et al. 1989). Factor one represents traits such as callousness, remorselessness and egocentricity; factor two represents a chronically unstable, antisocial, and socially deviant lifestyle. Recently, both a three-factor solution (Cooke and Michie 2001) and a four-factor solution (Hare 2003) have been argued to provide a better fit for the data. Mean PCL-R scores in the present sample were 16.18 (*SD* = 7.90).

The VRAG is an actuarial risk assessment instrument developed and standardized on male offenders admitted to a maximum-security forensic hospital for evaluation. It has been used to predict risk of violent recidivism and has been shown to generalize to additional samples (e.g., Glover et al. 2002; Grann et al. 2000), although questions remain regarding the extent to which it improves upon psychopathy in isolation (Cooke et al. 2001; Edens et al. 2006; Kroner and Mills 2001). It is comprised of 12 items that combine to produce a total score. In the validation studies VRAG scores were shown to be statistically related to risk of violent offending at two time points: seven and ten years. The mean VRAG score in this sample was 5.36 (*SD* = 9.89).

The HCR-20 is an instrument designed as a structured guide for clinicians in assessing risk of future violence. The HCR-20 contains three subscales: historical, clinical, and risk management items. These scores are combined to provide an overall risk score. The authors do not recommend using numbers on this instrument for clinical assessments. However, because the assessments were exclusively for research purposes, numbers (0, 1, 2) were assigned to each item, which is the method used most frequently in research reports of its criterion-related validity. In the present sample, the mean HCR-20 score was 23.76 (*SD* = 6.22).

All violence risk assessments were conducted by doctoral level psychologists extensively trained in the conduct of such assessments. All psychologists conducting the assessments attended a two-day workshop on the administration of the PCL-R. Additionally, group assessments were conducted with all psychologists to ensure reliability in scoring. Group assessments were conducted until the total PCL-R scores were within three points and no single item was ever scored two points differently. Inter-rater reliability varied dependent on the instrument used (average intraclass correlations varied from a low of .86 for the risk management subscale of the HCR-20 to a high of .97 for the total PCL-R score). Routine re-calibrations are performed regularly to prevent rater drift.

Self-Report Instruments

The Barratt Impulsivity Scale (BIS; Barratt 1994) is a self-report instrument consisting of 30 items to which the participant responds rarely/never, occasionally, often or almost always/always. The Barratt was designed to measure three components of impulsive behavior: motor, cognitive and poor planning.

The Novaco Anger Scale and Provocation Index (NAS-PI) (Novaco 1998) is a self-report instrument consisting of 85 items. Participants respond by characterizing their feelings to each item. The first 60 items are used to score the subscales of the NAS: cognitive anger, arousal, angry behavior and anger regulation. The remaining 25 items are used to score the Provocation Index.

To ensure that the participant could read and understand the self-report instruments, he/she was required to read the first several items aloud. If they were unable to do so, the instruments were read to them by a research assistant.

Criterion Measures

Behavioral indicators were tracked over the course of the patient's hospital stay. At NSH, when an unusual incident occurs, nursing staff are required to complete a Special Incident Report (SIR) documenting the incident. SIRs are completed for incidents of physical aggression (against either patient or staff), verbal aggression (against either patient or staff), self-injurious behavior, property damage, unauthorized absences, fire-setting, and other categories related to staff behavior. SIRs have been electronically maintained at NSH since August, 1998. The rate of aggression was calculated for each patient, based on the number of SIRs generated per unit time (hospital years). This standardization allowed for comparisons between patients with differing follow-up periods. Additionally, because of the skewed distribution of aggressive acts (most participants did not exhibit aggressive behavior) aggression scores also were dichotomized. In order to prospectively predict institutional aggression, only SIRs generated *after* the violence risk assessments were completed were used in the analyses. The average length of follow-up for the sample was 2.48 years (*SD* = .88), with a range of .97–4.01 years.

The average rates of physically aggressive acts per year were .11 (*SD* = .34) for staff-directed aggression, .16 (*SD* = .40) for patient-directed aggression, and .28 (*SD* = .64) for both categories combined. Including verbal aggression directed at staff and other patients only slightly increased these ratios, as SIRs involving these outcomes were very rare. As such, in this article we focus exclusively on physical aggression directed toward other patients or

staff. Although the staff- and patient-directed violence variables were highly associated ($r = .54$, $p < .01$) they were distinct enough to warrant separate analyses.[4]

Procedure

Participants were approached regarding their willingness to participate in the research based on a random list of all patients committed under the two above-noted penal codes (i.e., NGRI, MDO). Initially, patients were required to transfer to the CDRU for six months in order to participate in the research. However, because of the low consent rate and concerns regarding sample bias, the project was expanded to include participants from the four ''open units'' at NSH. These units are designed to allow greater freedom to the patients and as preparation for release into the community. Criteria for transfer to the open units include, among other things, not exhibiting aggressive behavior for a period of at least six months.

The study was designed as a prospective evaluation of the patients in the hospital. It is descriptive in nature and follows patients through their hospitalization and release into the community. It included a diagnostic assessment, assessments of psychiatric symptoms, assessments of violence risk, self-report measures of anger and impulsivity, and behavioral indicators of aggression. A thorough record review was also conducted to document demographic information and current chart psychiatric diagnosis. The only exclusion criteria for participation were (a) non-English speaking and (b) inability to reside on a co-ed unit secondary to sexually inappropriate behavior (only for those patients requiring transfer to the CDRU). If the patient expressed interest in participating in the study, the MacArthur Competence Assessment Tool for Clinical Research (MacCAT-CR; Appelbaum and Grisso 2001) was administered to ensure that the patient had the capacity to provide informed consent. Participants deemed capable of providing informed consent were then asked to review and sign an approved consent form.

Statistical Analyses

Point biserial correlations were performed to examine bivariate associations between the predictor variables and the dichotomized (0 = no aggression; 1 = one or more aggressive incidents) measures of aggression. Since the modal number of aggressive incidents across all three criterion measures was zero, we supplemented analyses on the outcome variables with Receiver Operating Characteristic (ROC) curve analyses. Area under the curve (AUC) values from ROC analyses, which are not influenced by the base rate of the criterion measures, represent the probability that a randomly selected violent patient would obtain a higher score on a risk factor than a randomly selected non-violent patient. The percentage of patients with one or more aggressive incidents was 16% (staff-directed), 22% (patient-directed), and 28% (combined).

Incremental validity across risk factors was examined using a two-step process. In the first step, hierarchical regression procedures were used to partial out the residualized (unique) variance in the relevant predictors of interest not attributable to other risk factors (e.g., variance in VRAG scores not explained by its association with psychopathy). Step two involved the construction of ROC curves in which these residualized risk factors were used to predict the dichotomized outcome measures (see Edens et al. 2006, for a similar example of this method). Given that the VRAG and HCR-20 incorporate the PCL-R as one item in their scoring, these variables were re-computed without this item to avoid overlap among the predictors.

The primary statistical analysis employed for identifying patient subgroups was k-means clustering to identify underlying patterns in the data. K-means clustering is a descriptive statistical technique used to identify distinct groupings, with the goal of minimizing variability within the cluster and maximizing variability between clusters. Once the clusters were identified, the external validity of the cluster solution was examined using demographic and clinical information. Post-hoc testing included analyses of variance and chi-square analyses.

To minimize redundancy, a subset of variables associated with the violence risk and clinical assessments were entered into the cluster analysis. This included the two factor scores of the PCL-R, the clinical and risk management subscales of the HCR 20, the total VRAG score, all subscales of the NAS-PI, the subscales of the Barratt and the positive symptom subscale of the BPRS. All variables were standardized using z-score transformations. A four-cluster solution appeared to be the best fit for the entered data. This solution reduced the within subject variability for all entered variables, resulting in a relatively even distribution of cases across clusters. Since k-means cluster analysis is a descriptive procedure, there is no statistical test to determine the number of clusters that best fit the data. One method that is frequently used is a cross-validation technique, wherein the data are randomly divided and cluster analyses are performed on each sample to arrive at the best fit. This procedure was not used secondary to the relatively small sample size.

[4] Since the criterion measures were positively skewed, we converted the ratio measures of aggression to dichotomized measures. The correlations reported are all point-biserial (see Table 2).

Results

Variable-Level Analyses

Table 2 presents the bivariate correlations between the violence risk assessments and subsequent patient violence, as well as the results of the ROC analyses. In terms of aggressive incidents in total (staff and patient-directed), the only statistically significant effect was for the HCR-20. The Risk Management scale of the HCR-20 was the strongest correlate overall and also obtained the highest AUC value, although the Clinical scale and the total score also were associated with overall aggression. When focusing more specifically on staff-directed aggression, the relationships were slightly weaker in magnitude. The HCR-20 (total score) significantly predicted staff-directed aggression, as did Factor 2 of the PCL-R and the VRAG (with and without the PCL-R included as an item). Patient-directed aggressive acts were not predicted particularly well by any factor of the PCL-R or the total score. However, the Facet 1 score evidenced a modest relationship with this type of aggression. For risk assessment measures, the HCR-20 evidenced the strongest relationship, with both the clinical and risk management scales evidencing moderate relationships with patient-directed aggression. The Historical subscale of the HCR-20 was unrelated to any type of aggression.

In terms of dynamic self-report risk factors, anger appeared to be modestly associated with aggression

Table 2 Bivariate associations between predictor and criterion measures

	Aggression-total *r*/AUC (*SE*)	Aggression-staff *r*/AUC (*SE*)	Aggression-patients *r*/AUC (*SE*)
Violence risk assessments			
Total PCL-R score	.09/.58 (.07)	.18/.66 (.07)*	.12/.62 (.07)
Factor 1	.08/.56 (.06)	.16/.63 (.07)	.09/.57 (.07)
Factor 2	.12/.60 (.07)	.21*/.66 (.07)*	.18/.65 (.07)*
Facet 1	.16/.62 (.06)	.18/.64 (.07)	.20*/.65 (.06)*
Facet 2	–.02/.49 (.06)	.07/.55 (.07)	.02/.51 (.07)
Facet 3	.10/.58 (.06)	.11/.60 (.07)	.13/.61 (.07)
Facet 4	.08/.56 (.07)	.18/.64 (.07)	.14/.60 (.07)
VRAG	.04/.54 (.07)	.19*/.65 (.08)*	.05/.55 (.07)
VRAG[a]	.10/.58 (.06)	.22*/.67 (.07)*	.11/.59 (.07)
Total HCR-20	.24*/.65 (.06)*	.20*/.65 (.07)*	.28**/.71 (.06)**
Historical	.13/.61 (.06)	.17/.65 (.07)*	.16/.64 (.06)*
Clinical	.23*/.61 (.06)	.14/.59 (.08)	.28**/.66 (.07)*
Risk management	.27**/.66 (.06)*	.16/.61 (.07)	.29**/.70 (.06)**
Barratt impulsivity scale			
Cognitive impulsivity	.11/.57 (.06)	–.03/.50 (.08)	.20*/.60 (.07)
Poor planning	–.02/.50 (.06)	.02/.53 (.08)	–.10/.46 (.07)
Motor impulsivity	.09/.55 (.06)	.08/.56 (.08)	.03/.58 (.07)
Novaco			
Cognitive anger	.12/.59 (.06)	.14/.61 (.08)	.03/.59 (.06)
Arousal	.11/.58 (.06)	.20*/.64 (.07)	.05/.58 (.06)
Angry behavior	.16/.60 (.06)	.26**/.68 (.07)*	.12/.58 (.07)
Total NAS	.14/.60 (.06)	.22*/.65 (.07)*	.07/.59 (.06)
Regulatory ability	–.03/.51 (.07)	–.11/.49 (.08)	.06/.54 (.07)
Provocation index	.02/.53 (.06)	.07/.55 (.07)	.02/.53 (.06)
BPRS			
Positive symptoms	.21*/.64 (.06)*	.08/.58 (.07)	.20*/.65 (.06)*
Negative symptoms	.05/.55 (.06)	–.03/.48 (.07)	.07/.57 (.06)
Hostility	.27**/.66 (.06)*	.06/.54 (.08)	.30**/.69 (.07)**
Depressive symptoms	.19*/.63 (.06)*	.10/.57 (.07)	.25**/.68 (.06)**
Total score	.30**/.70 (.06)**	.14/.64 (.07)	.31**/.72 (.06)**

*$p \leq .05$, **$p \leq .01$

[a] With PCL-R score removed

potential, with the angry behavior scale of the NAS demonstrating the strongest effects, but only with staff-directed aggression. Modest evidence regarding the relationship between cognitive aspects of impulsivity and aggressive incidents was noted, but only with patient-directed aggression.

In regard to psychiatric symptomatology, the BPRS was modestly related to aggression. Examination of the staff and patient variables indicated that this association was primarily driven by violence directed to other patients. The hostility subscale and the total score evidenced the strongest relationship to patient-directed aggression.

Although analyses of psychopathy indicated that it was an at best modest correlate of aggression in this sample, we conducted incremental validity analyses on the risk instruments to gauge the extent to which they continued to predict violence after controlling for any shared variance with the PCL-R. Table 3 summarizes the results of ROC analyses on residualized VRAG and HCR-20 scores after variance associated with the PCL-R was statistically controlled. As can be seen, the VRAG continued to be modestly associated with staff-directed aggressive incidents after controlling for PCL-R scores. The HCR-20 continued to explain a meaningful degree of variability in relation to patient-directed aggression and the combined category criteria, although not the staff-directed outcome. Similar results were obtained for the ''*R*'' scale when it was examined individually.

Table 3 Select incremental validity analyses for predictors significant at the bivariate level

	Aggression-total AUC (SE)	Aggression-staff AUC (SE)	Aggression-patients AUC (SE)
Scale residuals			
VRAG[a]	.54 (.06)	.61 (.07)	.54 (.07)
Total HCR20[a]	.67 (.06)*	.58 (.08)	.71 (.06)**
Historical	.55 (.06)	.55 (.07)	.56 (.06)
Clinical	.64 (.06)*	.54 (.08)	.67 (.07)*
Risk management	.67 (.05)**	.58 (.07)	.67 (.06)**
Barratt impulsivity scale[b]			
Cognitive impulsivity	.54 (.06)	.47 (.08)	.57 (.07)
Novaco anger scale and provocation index[b]			
Angry behavior	.56 (.06)	.68 (.07)*	.52 (.07)
Total NAS	.55 (.06)	.64 (.08)	.53 (.07)

*$p \leq .05$, **$p \leq .01$

[a] These are residualized scales in which the variance shared with the PCL-R has been statistically removed prior to performing the ROC analyses

[b] These are residualized scales in which the variance shared with the HCR-20 Risk Management scale has been statistically removed prior to performing the ROC analyses

In terms of the ability of the self-report dynamic factors to improve upon the violence risk instruments, Table 3 also summarizes the incremental validity analyses for those variables that had obtained a statistically significant effect at the bivariate level (i.e., Barratt cognitive impulsivity, NAS total score and Angry Behavior subscale). After controlling for variance explained by the HCR-20 Risk Management scale (the most consistent correlate of violence in our sample), only the Angry Behavior subscale continued to significantly predict any of the criterion measures. As such, there was relatively little evidence to suggest that predictive validity would be substantially improved by considering these measures in addition to those dynamic factors that are already incorporated into the Risk Management scale, although the modest effect sizes for the NAS suggest that perhaps it quantifies something of some utility beyond the Risk items, at least in relation to violent acts directed toward staff.

Group-Level Analyses

Figure 1 depicts the mean *z*-scores for each entered variable by cluster. As the figure depicts, a pattern emerged from the clustering procedure. In two clusters (1 and 3), the scores on the violence risk assessments were below the mean, whereas the remaining two (2 and 4) the violence risk assessments were above the mean. For impulsivity and anger, a similar pattern was found, but for the opposite cluster; that is, scores on impulsivity and anger were above the mean for clusters 1 and 4 and below the mean for clusters 2 and 3. This pattern was especially evident in the violence risk assessment and subscales of the NAS-PI (excluding the regulatory index). Table 4 provides the non-standardized mean scores of all assessments for each cluster.

To examine the external validity of the cluster solution, demographic and clinical factors were assessed for their relationship with each cluster. Table 5 depicts the results of

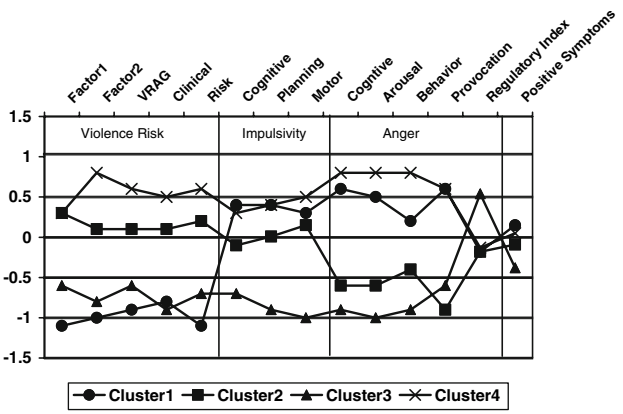

Fig. 1 Patterns of assessment results across clusters

Table 4 Mean scores for all assessments for four clusters

	Cluster 1 Mean (*SD*)	Cluster 2 Mean (*SD*)	Cluster 3 Mean (*SD*)	Cluster 4 Mean (*SD*)	*p*
Violence risk assessments					
Total PCL score	8.03(4.50)	19.29(5.96)	11.09(5.30)	21.98(5.96)	***
Factor 1	1.81(2.33)	7.48(3.20)	3.81(3.19)	7.43(3.31)	***
Factor 2	4.52(2.75)	9.26(2.88)	5.36(2.71)	12.07(3.01)	***
VRAG	–2.11(7.69)	6.92(8.59)	–.11(8.95)	12.13(7.30)	***
Total HCR20	17.79(4.84)	25.83(3.79)	19.04(4.74)	28.81(3.51)	***
Historical	10.95(3.06)	14.20(2.90)	11.55(3.61)	15.51(2.51)	***
Clinical	2.79(1.47)	4.84(1.88)	2.44(1.62)	5.89(1.91)	***
Risk management	4.05(2.09)	6.76(1.39	4.78(1.97)	7.46(1.44)	***
Barratt impulsivity scale					
Cognitive impulsivity	2.26(.44)	2.05(.40)	1.76(.40)	2.22(.44)	***
Poor planning	2.37(.32)	2.20(.30)	1.87(.35)	2.33(.34)	***
Motor impulsivity	2.23(.31)	2.15(.41)	1.61(.28)	2.30(.50)	***
Novaco anger scale and provocation index					
Cognitive anger	30.84(4.46)	24.80(3.07)	23.22(3.18)	31.78(3.86)	***
Arousal	29.95(4.43)	23.60(3.62)	21.30(3.09)	31.35(4.20)	***
Angry behavior	25.79(5.17)	22.08(3.82)	19.67(3.00)	28.81(4.39)	***
Total NAS	86.58(12.66)	70.48(8.74)	64.18(8.21)	91.94(9.93)	***
Regulatory ability	27.31(3.02)	27.32(4.73)	30.18(3.86)	27.51(3.54)	**
Provocation index	67.47(13.10)	44.56(10.30	49.07(11.38)	67.73(11.28)	***
Symptoms					
Total BPRS score	40.05(10.50)	34.92(11.73)	29.63(7.26)	38.89(12.66)	**
Positive symptoms	6.95(3.79)	6.08(3.45)	5.04(2.81)	6.59(3.87)	NS
Negative symptoms	8.16(3.29)	5.92(2.74)	5.63(3.56)	7.24(3.92)	*
Hostility	6.64(3.15)	5.96(2.91)	4.59(2.06)	6.68(3.33)	*
Depression	6.68(2.16)	6.72(3.41)	5.04(2.12)	6.84(2.96)	*

*$p < .05$, **$p < .02$, ***$p < .001$

these analyses. As can be seen from this table, gender and release status were related to cluster membership. Cluster 1 contained many more women than the other clusters ($\chi^2 = 14.34$, $df = 3$, $p < .01$). Cluster 3 contained most of the individuals who had been released from the facility ($\chi^2 = 28.18$, $df = 3$, $p < .001$).

Since we were interested in identifying factors associated with aggression in the hospital, patterns of aggressive behavior were examined for each cluster. A multivariate analysis of variance was conducted to determine if patterns of aggression (physical aggression against staff versus peers) differed between clusters. The overall multivariate test was significant (Roy's Largest Root = 4.03; $df = 3, 104$; $p < .01$). Individual post-hoc testing indicated that physical aggression against both staff and patients differed ($F(3, 104) = 3.41$, $p < .02$; $F(3, 104) = 2.96$, $p < .05$; respectively). The rate of physical aggression against staff was greatest in cluster 4. Figure 2 depicts the pattern of aggression for each cluster.

Discussion

The extant literature examining the relationship between psychopathy and aggressive behavior is mixed. Although early research indicated a strong relationship between psychopathy and violence, this appears to be largely restricted to community violence. While early indicators suggested a significant relationship between psychopathy and institutional aggression, recent research suggests that this relationship is weak. Our findings lend increased support for this conclusion and are informative on several fronts. At the bivariate level, the results of our study suggest that the PCL-R total score was not predictive of institutional violence, although Factor 2 scores in isolation were, but only for staff-directed aggression. Only the affective component of the PCL-R (Facet 1) evidenced a modest relationship with patient-directed aggression.

Both the HCR-20 and the VRAG demonstrated some utility in identifying violence-prone patients, although for the VRAG this (modest) association was limited to

Table 5 Cluster differences on demographic and clinical variables

	Cluster1 *N* (%)	Cluster2 *N* (%)	Cluster3 *N* (%)	Cluster4 *N* (%)
*Gender***				
Female	8(42)	1(4)	5(18)	3(8)
Male	11(58)	24(96)	22(82)	34(92)
Race				
African American	3(16)	4(16)	6(22)	11(30)
Caucasian	11(58)	18(72)	18(67)	23(62)
Other	5(26)	3(12)	3(11)	3(8)
Legal class				
NGRI	18(95)	19(76)	24(89)	28(76)
MDO	1(5)	6(24)	3(11)	9(24)
Instant offense				
Murder/manslaughter	8(42)	6(24)	7(26)	5(14)
Assault/battery	7(37)	10(40)	6(22)	19(53)
Sex offense	3(16)	6(24)	4(15)	3(8)
Theft	0(0)	1(4)	5(19)	6(17)
Arson	0(0)	1(4)	2(7)	3(8)
Miscellaneous	1(5)	1(4)	3(11)	0(0)
Primary axis I diagnosis				
Schizophrenia	8(42)	17(68)	13(48)	19(51)
Schizoaffective Disorder	6(32)	1(4)	5(18)	9(24)
Substance use disorders	0(0)	0(0)	2(7)	2(5)
Mood disorders	3(16)	2(8)	2(7)	3(8)
Other disorders	2(11)	5(20)	5(18)	4(11)
Primary axis II diagnosis				
Antisocial PD	2(40)	10(91)	1(25)	11(77)
Borderline PD	2(40)	0(0)	1(25)	1(7)
Other PD	1(20)	1(9)	2(50)	2(14)
*Released****				
Yes	0(0)	3(12)	11(41)	1(3)
No	19(100)	22(88)	16(59)	36(97)

$^{**}p < .01$, $^{***}p < .001$

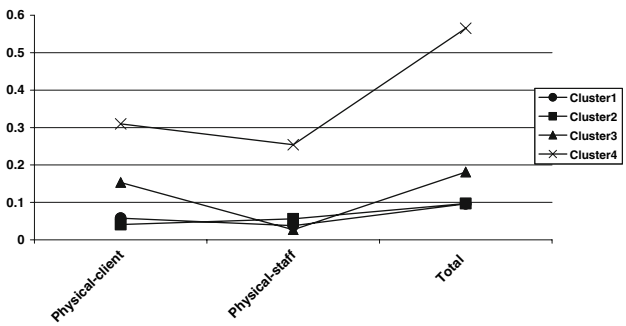

Fig. 2 Patterns of aggression across clusters

staff-directed aggression. For the HCR-20, the Risk Management items were most consistently and robustly related to violent acts, which in many regards is encouraging because these are the factors that are in principle most amenable to intervention (e.g., plans lack feasibility, lack of support, stress). Slightly weaker, but mostly significant, effects were noted for the Clinical variables as well, which is consistent with earlier research suggesting that this scale may be more relevant in institutional settings than the Historical items (McNiel et al. 2003). In fact, the Historical items evidenced no relationship with any of the criterion variables. At the multivariate level, both the HCR-20 and VRAG demonstrated incremental validity beyond the PCL-R in this sample, suggesting that they are tapping something of significance beyond just psychopathic traits (cf. Cooke et al. 2001; Edens et al. 2006; Kroner and Mills 2001). Consideration of other potentially dynamic risk factors in the domain of self-report offered some equivocal support for their utility at the bivariate level, with certain aspects of the impulsivity and anger measures evidencing modest positive associations with either staff or patient-directed aggression. Given the relative brevity and self-report nature of these instruments, future research might examine whether they would be efficacious as screening tools to identify those patients in need of a more extensive evaluation. In terms of incremental validity beyond the Risk Management scale of the HCR-20, only the Angry Behavior subscale continued to be significant after controlling for variance attributable to the Risk items. The total NAS score was no longer statistically significant, although the degradation in the AUC value was relatively minimal (i.e., dropping from .67 to .64).

Of considerable interest was the relationship between aggression and psychiatric symptoms: the strongest relationship between measured variables and patient-directed aggression was with the BPRS scores. Such was not the case for staff-directed aggression, where the point biserial correlations were close to zero. These results, taken together, indicate that the factors associated with staff versus patient-related aggression are quite different. Aggression directed at staff members appears associated with anger and affective dysregulation, whereas patient-directed aggression is primarily associated with clinical factors (as measured by the BPRS and the Clinical and Risk Management subscales of the HCR-20). There is some precedent for this, as in our previous work (Quanbeck et al. 2007) we found that assaults directed at staff members were most often associated with staff providing unwanted direction, thus arousing negative affect in patients prone to behavioral dysregulation (high Factor 2 scores). In contrast, assaults on other patients were often associated with psychotic symptoms.

There may be several reasons why this pattern observed in the bivariate relationships was found, most notably the overall lack of the PCL-R in predicting institutional aggression, as well as the strength of the Clinical and Risk

management scales. One explanation may lie in the types of patients in the sample. These are individuals who have been found either not criminally responsible for their crime or too dangerous for release (from prison) due to a psychiatric disorder. It is not surprising that measures of psychiatric illness, which includes the BPRS and to a lesser extent the Clinical and the Risk Management items of the HCR-20, evidence a more robust relationship with aggression. What is interesting is that this relationship seems limited to patient-directed aggression. It appears that staff-related aggression is most associated with anger, especially angry behavior. Not surprisingly, Factor 2 scores are associated with this type of aggression, reflective of affective/behavioral dysregulation. A closer examination of the individual items in the Clinical and Risk Management Scales indicated that two items were primarily responsible for the predictive ability of these two scales: impulsivity on the Clinical scale and exposure to destabilizers on the Risk Management scale, but only for patient-directed aggression. This adds further support that psychiatric/dynamic factors may be more relevant in the types of aggression observed in inpatient facilities.

Another explanation for the apparent lack of association between the PCL-R and any of the criterion variables is the sampling method. As noted in the procedure section, in order to ensure that the study included women, the research unit was designed to house both men and women. As such, the sample of men was limited to only those who could safely reside on a co-ed unit, which traditionally has excluded excessively violent men and sex offenders. When the sampling was expanded to include individuals on open units (typically viewed as a transition unit to conditional release), again the more aggressive men (and women) were not included. In support of this hypothesis, the average score on the PCL-R for our sample was 16, well below the published norms for forensic patients in both the 1991 and 2003 manuals. Even when women are not included in the sample, the average PCL-R score is only 17, placing them at the 43rd percentile according to the 2003 norms. Clearly the sample consists primarily of individuals not considered highly psychopathic, although PCL measures have predicted violence in other samples in which most of the participants obtained relatively low scores (e.g., Skeem and Mulvey 2001). Nevertheless, this restriction of range may have limited the associations between psychopathy and aggression in our sample. As we continue to collect data, we are making an effort to include individuals who may score higher on the PCL-R.

At the group-level (rather than variable-level), our data revealed that four clusters fairly clearly described the studied patients. One cluster, which contained most of the women in the study, evidenced below average scores on standard violence risk assessments, but above average scores on impulsivity and anger. Rates of both types of aggression (patient and staff directed) were relatively low for this cluster. The second cluster evidenced above average scores on violence risk assessments, average scores on impulsivity and low scores on anger, especially the provocation index of the NAS-PI. Interestingly, although the violence risk scores were relatively high (average PCL-R score of 19.3), this cluster evidenced the lowest rates of physical aggression against other patients in the hospital and very low rates of physical aggression against staff. Overall, these patients evidenced the lowest rates of aggression of the studied patients. The third cluster, which contained most of the patients released from the facility, evidenced below average scores on violence risk assessments and below average scores on measures of anger and impulsivity. Interestingly, although many of these patients have been released or are residing on open units, they evidenced the second highest rate of aggression against other patients. This is significant, given that the criteria for release or transfer to an open unit includes no physical aggression for six months. Additionally, PCL-R scores were quite low for this group of patients (average PCL-R score of 11). The final cluster evidenced the highest scores on all violence risk assessments, as well as on the NAS-PI and the BIS. This group of patients accounted for most of the violence exhibited in the studied patients, especially violence against staff members. When aggression against staff was dichotomized, this cluster of patients accounted for 65% of such violence. These results are consistent with the bivariate findings; that is, that anger in particular was most associated with staff-directed aggression and that the PCL-R score, by itself, was not associated with any type of aggression. Additionally, these results suggest that relatively easy to administer self-report instruments may be useful in identifying individuals more at risk for exhibiting aggressive behavior in an inpatient setting.

There has been controversy regarding whether the construct of psychopathy itself is related to violence or whether it is the behavioral/antisocial aspects of the most widely accepted measure of psychopathy (PCL-R) that drive most of the predictive power. Skeem and her colleagues (Skeem et al. 2005) in an effort to unpack the underlying constructs, provided evidence, in a civil psychiatric sample, that higher order personality constructs are the most potent predictors of community aggression. They found that antagonism was especially relevant in postdicting violence and that the Factor 2 (of the PCL-SV) associations with violence in individuals with mental disorder may be evidence of personality traits associated with social deviance. Our study suggests that such may be the case with institutional violence observed with forensic patients. Those individuals who exhibited the most violent behavior scored highest on the PCL-R, the VRAG, and the

behavior subscale of the NAS-PI. However, when the factor scores of the PCL-R were examined, it was the behavioral factor that distinguished the fourth cluster from the remaining three. Regarding the bivariate analyses, the non-significant effects for Factor 1 are consistent with the general pattern of findings in the literature regarding its comparatively weaker association with violence (e.g., Gendreau et al. 2002; Guy et al. 2005; Skeem and Mulvey 2001; Walters 2003; cf. McNiel et al. 2003) and raise concerns about the use of prototypically psychopathic traits (e.g., superficial charm, remorselessness) to inform violence risk assessments when such traits appear to have little bearing on the likelihood of violence (DeMatteo and Edens 2006; Edens et al. 2001). Both the cluster analysis and the bivariate correlations provide support for the notion that the PCL-R, by itself, is inadequate in explaining the types of violence observed in forensic facilities.

One way to understand some of the divergent findings is to examine the types of aggression that are exhibited and the types of patients exhibiting the aggression. Research has supported two general types of aggression observed in both humans and animals, which are varyingly termed predatory (or instrumental) and reactive (or impulsive or affective) aggression (McEllistrem 2004). Recent research suggests that in psychiatric patients there may be a third type, described as psychotic aggression (Nolan et al. 2003; Quanbeck et al. 2007). In a recent study conducted in the UK, patients with comorbid schizophrenia and psychopathy evidenced a more aggressive and impulsive personality style (Fullam and Dolan 2006). In another study conducted in Spain, anger and impulsiveness were highly correlated with impulsive aggression, although not with instrumental aggression (Ramirez and Andreu 2006). Psychopathy was not quantified in this study, however. It is conceivable that the traits of psychopathy most associated with Factor 1 scores on the PCL may be more relevant to the prediction of specific types of aggressive acts, such as predatory rather than reactive/affective violence (McEllistrem 2004). Prospective research to examine such hypotheses is sorely lacking at present, however. Retrospective studies (e.g., Woodworth and Porter 2002) offer some support for this hypothesis, but also obviously suffer from criterion contamination issues in which the scoring of the PCL-R is confounded to varying degrees with the past behavior of interest. Cornell et al. (1996) attempted to avoid this confound by having raters score the PCL-SV without knowledge of the individual's offense. They found some support for the concept that instrumental offenders scored higher on this measure of psychopathy. However, this definition of reactive offenders included individuals who could have committed planned, predatory crimes.

The mechanisms underlying why psychopathy is so highly associated with community violence, yet not related to institutional aggression, are not entirely clear. Recently there has been considerable debate regarding those aspects of psychopathy that are related to violent and aggressive behavior. For example, it has been proposed that the link is related to impulsivity and propensity toward risky behavior (Guy et al. 2005). Additionally, the diminished affective experiences associated with psychopathy may lead to a disinhibition of normal protective factors. However, recent research has suggested that it is the lifestyle/behavioral aspects of the PCL measures that carry most of the predictive power (Skeem and Mulvey 2001; Salekin et al. 1996; Walters 2003). As well, research suggests that the antisocial behavior exhibited by psychopaths is more a consequence (rather than a symptom) of psychopathy (Cooke et al. 2004). Our data are consistent with previous studies that suggest that psychopathy in isolation is insufficient in predicting institutional violence. In fact, the classic characterologic aspects of a psychopath provided little insight into the aggression exhibited in our facility. Both our variable-level and group-level analyses suggest that the Factor 1 scores of the PCL-R performed poorly in predicting those patients who might exhibit aggression. Factor 2 scores provided more information in this regard, although other instruments were both useful and necessary in identifying predictors of aggressive behavior. The clinical and risk management items of the HCR-20, as well as measures of anger and psychiatric symptoms were all useful in predicting certain types of institutional violence (staff versus patient directed). Continued work is necessary to elucidate whether certain types of aggression (impulsive versus predatory) are associated with different patient characteristics.

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