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Jalil, Rahul; Huber, Jorg; Sixsmith, Judith; Dickens, Geoffrey

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**INCREMENTAL VALIDITY OF PATIENTS' SELF-REPORTED ANGER BEYOND
STRUCTURED PROFESSIONAL JUDGEMENT TOOLS IN THE PREDICTION OF
INPATIENT AGGRESSION**

Rahul Jalil ^{a*1}

Jorg W. Huber ^b

Judith Sixsmith ^c

Geoffrey L. Dickens ^d

^a University of Northampton, School of Health, Boughton Green Road, Northampton, UK.
NN2 7AL

^b University of Brighton, School of Health Sciences, Falmer, Brighton, UK. BN1 9PH

^c University of Dundee, School of Nursing and Health Sciences, 11 Airlie Place, Dundee,
UK. DD1 4HJ

^d Abertay University, School of Social and Health Sciences, Bell Street, Dundee, UK. DD1
1HG

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of Northampton.

*Corresponding author: { [HYPERLINK "mailto:rahul.jalil@bcu.ac.uk"](mailto:rahul.jalil@bcu.ac.uk) }

¹ Present address: Birmingham City University, Department of Psychology, 4 Cardigan
Street, Birmingham, UK. B4 7BD

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Abstract

Mental health inpatients' self-reported violence risk predicts actual aggressive outcomes. Anger, for which there are well-evidenced interventions, commonly precedes inpatient aggression. We aimed to determine whether patients' self-reported anger added incremental validity to violence prediction beyond routinely completed violence risk assessments. A correlational, pseudo-prospective study design was employed. $N=76$ inpatients in secure hospitals completed self-report validated anger measures; routinely collected clinicians' ratings on structured professional judgement tools, and aggressive incident data for a 3-month follow-up period were extracted from clinical records. Thirty four (45%) participants were violent; self-reported-anger and clinician-risk ratings were significantly positively correlated. Self-reported anger predicted aggressive outcomes but not incrementally beyond relevant risk assessment subscale and item scores. It may not be beneficial for all patients to self-report anger as part of continuous violence risk assessments, but those who score highly on anger-relevant items of risk assessment tools could be considered for further assessment to support risk-management interventions.

Introduction

Aggressive patient behaviour on psychiatric wards is common (Bowers et al., 2011) and the psychological, emotional and financial consequences are substantial (Flood, Bowers, Parkin, 2008; Rippon, 2000; Uppal & McMurrin, 2009; Wykes & Whittington, 1998). Typically, violence risk assessments are completed by clinicians to aid formulations about the likelihood and nature of risk, its management and treatment for the duration of patients' hospitalisation and following discharge or transfer. Violence risk assessment tools, including for inpatient use, commonly comprise organised schedules of known risk factors, each of whose presence and relevance clinicians are required to consider. In the structured judgement approach, the outcome of this exercise is integrated with clinical expertise and case-specific knowledge to devise a formulation about the likelihood, nature, and circumstances of future aggressive behaviour.

The Historical-Clinical-Risk-Management 20 (HCR-20; Webster, Douglas, Eaves & Hart, 1997) is the most commonly used tool in forensic mental health settings (Khiroya, Weaver & Maden, 2009). It contains both static (i.e., historical) and dynamic risk factor items. Studies have shown that the HCR-20 has good predictive validity for inpatient aggression. A systematic review (O'Shea, Mitchell, Picchioni & Dickens, 2013) involving 2,067 patients across 20 studies found that the summary judgment (i.e., Low, Moderate, High) of risk was a stronger predictor of inpatient aggression than any of the HCR-20 subscales. Although this finding is promising, as it is the approach advocated by the tools' authors to derive a judgement of overall risk level, it has been criticised for its limited ability to inform day-to-day treatment and management of risk factors (Ogloff & Daffern, 2006; Ireland et al., 2016). A second tool, the Short-Term Assessment of Risk and Treatability (START; Webster, Martin, Brink, Nicholls & Desmarais, 2009), comprises 20 dynamic risk factor items. Its use is intended to aid risk prediction in the shorter-term (three months) and

for a range of adverse outcomes in addition to violence. The dynamic items are to be considered in terms of both strengths (protective factors) and vulnerabilities (risk factors) which sets the START apart from other SPJ tools (Nonstad et al., 2011).

Despite advances in risk assessment research, the current evidence base has lagged in terms of management interventions. This may partly be because frontline staff members, such as nurses and healthcare assistants who take a hands-on approach in the delivery of care plans, are perhaps not always involved in the completion of violence risk assessment process or relevant risk information is not sufficiently communicated (Bruton, Norton, Smyth, Ward & Day, 2016; Eivergard, Enmarker & Hellzen, 2016). The question of whether SPJ tools are effective and efficient in respect of risk management requires further exploration. A greater understanding of the identification and assessment of relevant dynamic risk factors allied with further research into relevant treatment interventions would be a good first step.

Anger is a well-established antecedent of inpatient aggression (Bowers et al., 2011; Daffern & Howells, 2009) and has been shown to be one of the strongest predictors of violence (Doyle & Dolan, 2006; McDermott, Edens, Quanbeck, Busse & Scott, 2008; McDermott, Quanbeck, Busse, Yastro & Scott, 2008; Vitacco et al., 2009). The provision for assessment and treatment of anger, compared with that for depression and anxiety, has lagged in mental health care (DiGiuseppe & Tafrate, 2007). Anger has often, incorrectly, been perceived as a behavioural manifestation of psychotic symptomatology rather than of dysregulated emotion warranting of clinical attention (Novaco, 2010). This may partly explain the relative neglect of direct assessment and treatment of anger in the context of inpatient aggression, despite evidence indicating that anger management programmes in hospital settings are effective in reducing aggression (Jones & Hollin, 2004; Renwick, Black, Ramm & Novaco, 1997; Wilson et al., 2013).

Further, anger is not specifically named as a risk factor item in either the HCR-20 or the START. The omission is perhaps understandable since items in both tools are broader and encapsulate anger amongst a range of other dispositions/presentations. For example, in the START, anger is identified as one of eleven descriptors ('angry') for the item *Emotional State* (others include 'pessimistic', 'lethargic', and 'emotionally restricted'). In addition, potential anger synonym terms 'hostile' and 'aggressive attributional style' are included among 15 descriptors for the *Attitudes* item (Webster et al., 2009). In the HCR-20, elements of the anger construct appear to be embedded in three of the Clinical subscale items: in the description of the *Lack of Insight* item, raters are advised to 'determine the extent to which the person perceives himself or herself to be dangerous, angry, or out of control'; for the *Impulsivity* item that 'behavioural and affective instability' be considered; and, for the *Unresponsive to Treatment* item, that attention should be given to 'whether the individual has recently been placed in seclusion and for what reasons, and whether there have been occurrences of angry outbursts and rage episodes' (Webster et al., 1997).

The responsibility for gauging the presence and relevance of anger in violence risk assessment using these tools lies with the evaluator(s); they are advised to consult a range of available sources including clinical notes, clinical interview with, and observations of, the individual. While the assessment might be informed by formal, validated assessments of anger, where they are present, there is no requirement for raters to undertake any systematic measurement of anger. DiGuiseppe and Tafrate (2007) define anger as multidimensional to include physiological, cognitive and behavioural aspects which can manifest as state or trait characteristics. As described above, the assessment of anger in the HCR-20 and the START form part of a global evaluation and thus, presumably, may rely more on raters' confidence and ability to detect its presence and relevance than on any objectively determined criteria. However, Desmarais, Nicholls, Read and Brink (2010) have reported that the judgements of

evaluators who had higher confidence in their ratings on an SPJ tool were actually associated with lower predictive accuracy for risk outcomes.

In relation to anger, this leads to two important questions. First, is patients' self-reported anger associated with clinicians' ratings on respective items in routinely completed violence risk assessments: i.e., do relevant items accurately reflect the content of validated anger assessments? Second, does self-reported anger on a validated measure increase risk prediction incrementally over that achieved by the tools' more globally-oriented items. This is important not only for risk assessment but also with regard to the recommendation of appropriate treatment interventions. In brief, could a more objective approach to evaluation of the presence of anger inform violence risk assessment and risk management planning? The aim of the present study, therefore, is to examine associations between patients' self-reported anger and clinicians' ratings on relevant dynamic risk factor items from the HCR-20 and the START, and subsequently to examine whether self-reported anger adds incrementally to the predictions of inpatient aggression.

Methods

Setting and Participants

The present study was conducted on medium and low-secure wards constituting the men's and women's adult mental disorder pathways at St Andrew's Healthcare, a United Kingdom provider of specialist mental health care. Relevant wards are located in Northampton, Birmingham, and Essex. Each wards' responsible clinician identified patients from their caseload based on the inclusion criteria for potential participation and were subsequently approached to provide further study information. Eligible participants were inpatients over the age of 18 years, diagnosed with one or more mental disorder based on the World Health Organisation (2011) International Classification of Diseases and Related

Health Problems 10th Revision (ICD-10), and who had been subject to two of the routinely completed Structured Professional Judgement (SPJ) assessments, HCR-20 and START, prior to participation. Patients were not eligible if they had a diagnosis of a neurocognitive or neurodevelopmental disorder, lacked the capacity to consent, or were not fluent in the English language.

Design

Manuals for both HCR-20 and START were carefully considered in order to identify how the concept of anger was operationalised and defined within them, followed by detailed discussions between the authors and clinicians. A correlational and pseudo-prospective cohort design was employed to test: i) the hypothesised relationships between patients' self-reported anger and clinician-rated items in the SPJ tools; and ii) whether the self-reported anger added incremental validity in the prediction of aggressive behaviour over a 3-month follow-up period.

Procedure

The study was one part of a doctoral thesis by author RJ which received approval from the University of Northampton Research Ethics Committee, the Leicestershire, Northamptonshire and Rutland NHS Research Ethics Committee (Reference: 13/EM/0020. IRAS ID: 120833), and the St Andrew's Healthcare Research and Development Committee. Patients were recruited between April 2013 and May 2015. The SPJ assessments used in the study were completed by multidisciplinary teams as part of routine practice in the same period; patients provided their consent for the researchers to access these assessments as part of the study. All eligible patients were approached with the study information sheet. Only those expressing interest and, subsequently on being given full information, consent, were then enrolled in the study and interviewed. The study questionnaire (see below) was

completed during the pre-arranged interview conducted by author RJ (forensic psychology masters' graduate and doctoral student) in a quiet room on the ward. Data concerning aggressive behaviour were retrieved from relevant electronic patient records over a three month duration following participation. This follow-up period was judged appropriate for the study given that the START is recommended to be completed every three months (Webster et al., 2009; Dickens & O'Shea, 2015), or sooner if there is reason to suspect a change in the patients' risk profile.

Measures

Novaco Anger Scale (Novaco, 2003)

The Novaco Anger Scale is a 60-item measure comprising four subscales, each addressing an aspect of anger disposition related to: Cognition, Arousal, Behaviour, and Regulation. The response format for each item is a 3-point unipolar visual analogue scale (1 = *Never True*, 2 = *Sometimes True*, and 3 = *Always True*) and scoring produces subscale scores and a total score based on 48 items across the Cognition, Arousal and Behaviour subscales. The Inconsistency Reporting Index is a check as part of the scoring method that is based on 16 selected item-pairs, to eliminate random or deliberately inconsistent reporting which is indicated by a large number of dissimilarities between item-pair scores. The measure was developed for use with various populations, including clinical forensic patients, and has been found to have good reliability including for the current sample (Cronbach's alpha .94) and excellent construct and concurrent validity (Novaco, 2003).

Historical Clinical Risk-management – 20 Version 2 (Webster, Douglas, Eaves & Hart, 1997)

The Historical Clinical Risk-management – 20 (HCR-20) is a comprehensive set of professional guidelines for the assessment and management of risk factors for violent

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behaviour. The tool consists of 20 items which are organised under headings i) Historical (10-items about the past); ii) Clinical (5 items about current clinical presentation) and iii) Risk management (5 items about adjustment under changing future circumstances). The coding is completed on two levels; evaluators must first determine the presence versus absence for each of the 20 items (0 = *No - The item is absent or does not apply*, 1 = *Maybe – The item possibly is present, or is present to a limited extent*, 2 = *Yes – The item is definitely present*, Omit = *Don't know – There is insufficient valid information to permit a decision concerning the presence or absence of the item*); second, the item-level information is integrated with all other relevant information to reach a summary judgement for future violence risk (*Low, Moderate, or High*). Multiple sources of information are recommended for use in completing the coding of the risk assessment including file review, interview and testing. At the time of this study, version 2 of the HCR-20 was being used as version 3 had not yet been implemented in the hospital. The HCR-20 was completed as part of routine clinical practice by registered psychologists or assistant psychologists under their supervision, and ratified by the clinical team. For the purposes of research, the HCR-20 is used in an actuarial manner (Campbell, French & Gendreau, 2009; Singh, Grann & Fazel, 2011); that is by summing individual item ratings to derive a total score that can range from 0 to 10 for each dynamic risk scale (*HCR-20 Clinical Total* and *HCR-20 Risk-management Total*) and 0 to 20 for the Historical scale. The dynamic risk subscales only were used for the purposes of this study. In the HCR-20 manual (Webster et al., 1997), item descriptions for *Lack of Insight (C1)*, *Impulsivity (C4)* and *Unresponsive to Treatment (C5)* recommend that evaluators consider anger. Thus, clinicians' ratings of C1, C4 and C5 were examined to test the association with patients' self-reported anger. The average mean number of days between administration of the HCR-20 and study participation was 80.8 ($SD = 44.5$).

Short-Term Assessment of Risk and Treatability (Webster, Martin, Brink, Nicholls & Desmarais, 2009)

The Short-Term Assessment of Risk and Treatability is an assessment for multiple risk behaviours: violence, suicide, self-harm, victimization, substance use, unauthorised absences and self-neglect. For each behaviour, the evaluating team is required to estimate the level of risk (*Low, Moderate, or High*) following the rating of the scheme's 20 dynamic risk items and consideration of other relevant factors. Ratings are made for each item in relation to *strengths* (0 to 2) and *vulnerabilities* (0 to 2). Vulnerabilities comprise features or characteristics that are likely to be associated with increased likelihood of adverse outcomes, whereas Strengths are positive attributes that serve as a resource to reduce, mitigate and manage the likelihood of adverse outcomes. The START was completed as part of routine clinical practice by trained members of the clinical team. In the study setting, it is required that the completed START for each patient is signed off by three members of the clinical team from different professions (psychiatrist, psychologist, nurse, occupational therapist, social work). In the START manual, descriptions for vulnerability on the items *Emotional State* and *Attitudes* refer to the construct of anger. As a result, clinicians' ratings of these items were thus used in this study to test the association with patients' self-reported anger. Clinicians' ratings on all the strength and vulnerability items were summed for a 'START *total strength*' and 'START *total vulnerability*' score (both possible range 0-40) and were also used for the purpose of this study. The average mean number of days between administration of the START and study participation was 47.1 (*SD* = 34.8).

Overt Aggression Scale (Yudofsky, Silver, Jackson, Endicott & Williams, 1986)

The Overt Aggression Scale (OAS) aims to capture information about the frequency and severity of four categories of aggressive behaviour (verbal, physical against objects, self

or others). The OAS was used to rate incidents which had been recorded on RiO, the electronic recording system used in the study setting. Clinical staff members are expected to make at least one narrative entry regarding the patient on RiO per shift, as dictated by the hospital policy directive. Before the note can be verified, the staff member is prompted to add one or more 'flags' to the entry. Thus the entire notes regarding the patient can be searched by filters such as flags, dates, times, etc. Case notes that were electronically flagged as either: 'Aggression – Physical', 'Aggression – Verbal', 'Fire setting', 'Hostage Taking', 'Intimidation/Bullying', 'Self-Harm/Suicide', and "Sexual Offending" and that had occurred in the follow-up period were obtained for all patient participants. Each incident was coded against the categories in the OAS by the authors and who were blind to the predictive measure assessments. Inter-rater reliability was tested on all identified incidents and categorical agreement on aggression type was in the substantial range ($K = 0.74$). To reduce the number of aggression types analysed, aggressive outcomes were amalgamated into two dichotomised (absent/present) categories: any aggression ('*any aggression*'; included verbal aggression, physical aggression towards objects, self and others) and physical aggression towards others ('*physical aggression*').

Clinical and Demographic Characteristics

Patients' gender, age, self-reported ethnicity, admission/discharge date (length of stay), ward security level and ICD-10 diagnoses were extracted from clinical records. Also, a registered psychologist from each clinical team completed the Clinical Global Inventory-Severity (CGI-S; Busner & Targum, 2007). The CGI-S provides an overall clinician-determined summary measure of mental illness that takes into account all available information, including knowledge of the patient's history, psychosocial circumstances, symptoms, behaviour, and the impact of the symptoms on the patient's ability to function. In practice, the CGI-S captures the overall clinical impression of the patient. It is a 1-item

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measure that asks the respondent the following question: "Considering your total clinical experience with this particular population, how mentally ill is the patient at this time?"

Ratings for the severity of the patients' presenting illness is indicated on a 7-point scale (1 = *Normal, not at all ill*, 2 = *Borderline mentally ill*, 3 = *Mildly ill*, 4 = *Moderately ill*, 5 = *Markedly ill*, 6 = *Severely ill*, 7 = *Among the most extremely ill patients*). As symptoms can fluctuate over a week; the score reflects the average severity level across the previous seven days.

Data Analysis

Initially, data were subjected to normality testing using the Shapiro-Wilk test in conjunction with inspection of histograms, kurtosis and skewness values as recommended by Field (2013); bootstrapping was applied where assumptions of normality were violated. Bootstrapping is a robust method to correct for bias by resampling with replacement and provides confidence intervals for a statistical parameter including the mean, odds ratio, correlation and regression coefficients (Field, 2013).

Means and standard deviations for scale variables and frequencies/percentages for categorical variables measured in the study were calculated. Independent *t*-tests were used to ascertain any differences in self-reported anger and dynamic risk item and subscale scores between aggressive outcomes (any aggression and physical aggression only). The magnitude of difference in scores was denoted by the *t*-value converted into an *r*-value (Rosnow & Rosenthal, 2005) for an effect size, with the following thresholds: small (.20), medium (.30) and large (.50). Pearson's correlation was used to explore the relationship between patients' self-reported anger and clinicians' ratings on anger-related items in the dynamic risk subscales. Receiver operating characteristic (ROC) analyses was used to calculate Area Under the Curve (AUC) for the predictive validity of variables on any aggression and

physical aggression-only as the outcome. The AUC value ranges from 0 (perfect negative prediction) to 1 (perfect positive prediction), with .5 representing performance of the measure being equivalent to chance. Although there is some variation in the literature (Singh, Desmarais & Van Dorn, 2013) for thresholds in indicators of performance, Rice and Harris (2005) report that AUC values of .556, .638, and .714 respectively are equivalent to small (.2), moderate (.5) and large (.8) Cohen's *d* values (Cohen, 1992). To ascertain incremental predictive validity of self-reported anger, a hierarchal logistic regression test was used. Only the statistically significant dynamic risk subscale predictor(s), as determined by the ROC analyses, were entered first into the regression model, followed by self-reported anger in the second step of the model. The reverse entering of predictor variables in the steps of the model was also conducted. Incremental validity is thus indicated by significant changes in the chi-squared values in improvement between the two steps in the hierarchal logistic regression model (Field, 2013). Analyses were conducted using IBM Statistics version 22 for Windows (SPSS Inc., Version 22).

Results

Participant Clinical and Demographic Characteristics

In total, 76 patients (50% male) were recruited into the study (see Table 1). Participants had been resident on inpatient wards for a mean of 2.9 years ($SD = 2.8$) and were considered 'moderately ill' ($M = 3.8$, $SD = 1.5$) in terms of severity of presenting problems as indicated on the CGI. There were 238 recorded aggressive incidents. More males than females exhibited aggression: of those who exhibited any form of aggressive behaviour 65% were male, and of those who exhibited physical aggression 62% were male. Analysis of potential covariates between the predictive measures revealed that, apart from HCR-20 scores, females had significantly higher NAS Total and START Vulnerability scores; there

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were no significant differences on participant ethnicity, diagnosis or the ward security level in which the participant resided.

>>Insert Table 1 about here<<

Association between patients' self-reported anger score and clinician-rated SPJ anger-related item scores, and between aggressive outcomes

Scale scores for patients' self-reported anger (NAS Total) and clinician-rated items on the dynamic subscale between aggressive outcomes are presented in Table 2. For the category 'any aggression', analysis revealed significant differences in mean scores for both of the HCR-20 dynamic risk subscales, as well as the HCR-20 C5 and the START Emotional State items. For physical aggression only, analysis revealed differences in mean score for the NAS Total, two of the HCR-20 Clinical items, the HCR-20 Clinical Total subscale and the START Strength Total subscale. Statistical differences were indicated with a small to medium effect size in both aggressive outcomes.

>> Insert Table 2 about here<<

Correlational analyses revealed associations between patients' self-reported anger and dynamic risk item ratings and total subscale scores in expected directions (see Table 3). The strongest, positive association was between NAS Total and HCR-20 Clinical Total subscale, followed by HCR-20 Impulsivity (C4).

>> Insert Table 3 about here<<

Predictive and Incremental Validity

The AUC values (see Table 4) indicated that NAS Total, HCR-20 Clinical Total and HCR-20 Risk-management Total has significant medium to large predictive validity for any aggression. The remaining variables did not predict this outcome with statistical significance.

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For physical aggression-only, the AUC values revealed that NAS Total, HCR-20 Clinical Total and START Strengths Total were also significantly predicted with medium to large effect sizes, but not HCR-20 Risk-Management total and START Vulnerabilities Total.

>> Insert Table 4 about here<<

Statistically significant dynamic risk subscale scores as identified by AUC values were block entered into the first model of the hierarchical logistic regression, along with patients' self-reported anger in the second model, for both aggressive outcomes (see Table 5).

For any aggression, model 1 (HCR-20 Clinical Total and HCR-20 Risk-Management Total) was statistically significant $\chi^2 = 12.88, p < .01$. The model explained 21% of the variance and correctly classified 70% of cases. Sensitivity was 64.7%, specificity was 73.8%, positive predictive value was 66.7% and negative predictive value was 72.1%. Of the two predictor variables, only HCR-20 Clinical Total was statistically significant. Increasing HCR-20 Clinical Total scores is associated with aggression (OR 1.38). Model 2 (HCR-20 Clinical Total, HCR-20 Risk-Management Total and NAS Total) was also statistically significant $\chi^2 = 13.00, p < .01$. The difference (0.12) between Model 1 and Model 2 was not statistically significant thus indicating that there was no incremental validity of self-reported anger present. Linearity of the logit was also tested which revealed that interaction terms were not significant $p > .05$, and thus did not violate the assumption. Collinearity diagnostics confirmed that there were no concerns with multicollinearity (VIF = 1.34, Tolerance = 0.75).

For physical aggression only, model 1 (HCR-20 Clinical Total and START Strengths Total) was statistically significant $\chi^2 = 15.15, p < .01$. The model explained 30% of the variance and correctly classified 83% of cases. Sensitivity was 15.4%, specificity was 97%, positive predictive value was 50% and negative predictive value was 85%. Of the two predictor variables, only the HCR-20 Clinical Total was statistically significant. Increasing

HCR-20 Clinical Total scores was associated with physical aggression (OR 1.82). Model 2 (HCR-20 Clinical Total, START Strengths Total and NAS Total) was also statistically significant $\chi^2 = 16.81, p < .01$. The difference (1.66) between Model 1 and Model 2 was not statistically significant thus indicating that there was no incremental validity of self-reported anger present. Linearity of the logit was also tested which revealed that interaction terms were not significant $p > .05$, and thus did not violate the assumption. Collinearity diagnostics confirm that there were no concerns with multicollinearity (VIF = 1.43, Tolerance = 0.70).

>> Insert Table 5 about here<<

Discussion

In the current study, we examined the role of anger in inpatient aggression and its role for risk assessment for aggression. The hypothesis that patients' self-reported anger would be related to clinicians' ratings on selected items of routinely recorded risk assessment schedules is supported by the current findings. The strongest association was between items in the Clinical subscale of the HCR-20 and anger, namely: *Impulsivity (C4)*, *Lack of Insight (C1)* and *Unresponsive to Treatment (C5)* in that order. The *START Emotional State* and *Attitude* items were also significantly positively related to patients' self-reported anger, which could also suggest that anger-related descriptor items are being correctly interpreted by raters and incorporated into item rating. Additionally, ROC analyses indicated that patients' self-reported anger was itself significantly predictive of both aggressive outcomes, namely any aggression and physical aggression-only. Different combinations of clinician-rated HCR-20 dynamic risk subscale items were found to be predictive of any aggression and physical aggression-only, but the tool's Clinical total score consistently predicted both outcomes. However, a hierarchical logistic regression model did not indicate incremental validity for

patients' self-reported anger, in either aggressive outcome, and HCR-20 Clinical Total remained the significant predictor variable.

These findings are, to some extent, consistent with previous research carried out by Doyle and Dolan (2006). Using comparable sample sizes and outcomes, both studies revealed similar baselines rates of aggression, similar AUC values for anger in the prediction of any aggression, and increased AUC values for anger for the prediction of physical aggression-only. The current study adds value by extending the findings to a sample comprising equal numbers of men and women, whereas Doyle and Dolans's work was conducted with a male-dominated sample. The failure of measured anger to incrementally predict aggressive outcomes could be explained by the suggestion that anger is neither necessary nor sufficient for aggression to occur (Novaco, 1986). Indeed, this may be axiomatic with regard to instrumental aggression; however, in the case of reactive aggression anger may be a key variable. In one study that did attempt to discriminate between reactive and instrumental physical aggression, McDermott, Quanbeck, et al. (2008) found that HCR-20 dynamic risk subscales had higher AUC values than the NAS for the prediction of reactive aggression. The authors reported AUC values from .70 to .71 for the Clinical and Risk-management subscales, and .67 for anger in the prediction of reactive aggression. It should, however, be noted that it has been notoriously difficult for researchers to successfully operationalise definitions, and subsequently accurately distinguish individual incidents, of aggression based on their cognitive (intent, motivation) or affective (emotional drivers) characteristics and these findings require replication (e.g., Bowers, Nijman & Palmstierna, 2007).

In the current study AUC values for the respective dynamic risk subscales fared slightly better, ranging from .66 to .81, and .75 for anger in the prediction of physical aggression. However, analysis revealed no incremental validity for self-reported patient anger over clinicians' rating on the dynamic subscales, for the prediction of any aggression or

physical aggression. Rather the clinician-rated HCR-20 Clinical subscale was the significant predictor. The HCR-20 Clinical subscale considers a range of current risk factors that contributes to patient's risk state for the likelihood of aggression, and anger may indeed be relevant but only in combination with other salient dynamic risk factors. One possible explanation is that raters are already accurately determining the extent and nature of the contribution of anger to individual violence risk within the rating of the relevant dynamic risk scale items and that more accurate consideration, e.g. through use of the NAS, is simply failing to contribute further. It is, however, noteworthy that the mean anger scores 93.6 – 101.1 as found in the current study for those that were aggressive are higher than the standardisation sample (83.9) for the NAS (Novaco, 2003), and previous studies (e.g., Doyle & Dolan, 2006; McDermott, Quanbeck, et al., 2008) using forensic samples (78.7 - 82.0) which seems conspicuously low. Nonetheless, if this is the case then it suggests that those rated at elevated risk for those items could be targeted for individual assessment of their anger. Indeed this is also supported by higher scores on relevant assessment items for aggressive over non-aggressive patients in the current study.

Nevertheless, the current findings add to our understanding of relationships between patient self-rated clinical measures and clinician-ratings of dynamic risk factors items on structured professional judgement tools. The relevance of anger is demonstrated by positive correlations between its self-report and clinicians' ratings of the items in the dynamic risk subscales. Increase in anger scores was associated with higher ratings on the dynamic risk items included in the subscales. This concurring view suggests that interventions directed at addressing anger dysregulation could help to minimise inpatient aggression risk. Evaluations of anger dysregulation interventions in high secure hospital settings (Wilson et al., 2013), correctional settings (Tew, Dixon, Harkin & Bennett, 2012) and among patients with intellectual disabilities in secure settings (Novaco & Taylor, 2015) have indicated a resulting

reduction in physical assaults. Further, given that risk assessments in the current study were conducted as part of routine clinical practice, the evidence that clinicians' risk ratings on relevant items corresponded with patients' self-reported anger should provide some confidence about the former's judgement.

Limitations

As with other studies that attempt to establish the predictive validity of risk assessments for inpatient aggression, it should be recognised that the clinical staff involved in the scoring of the SPJ tools in this study were also those operationalising a risk management plan which may have prevented incidents of inpatient aggression (Doyle & Logan, 2012). Thus, this may have impacted on the accuracy of the measures included in this study. However, data relating to the three-month reported aggressive incidents may be an insufficiently long follow-up period but were coded independently and blind to the predictive measures. It is also important to bear in mind that whilst it is advantageous to use clinicians' rating of the dynamic items in routine clinical practice to increase the ecological validity of findings, not all patients would have had this completed at the same time or proximally within the time of the self-reported anger assessment. In this study, the most recent SPJ assessment prior to the assessment of anger was retrieved, but it is possible that some patients were due another SPJ risk assessment as it is recommended to be completed every three months, or when there is a significant change in risk. A further study limitation concerns aggression and patient gender. These categorical variables are unsuitable for mediation analysis and we were thus unable to determine whether gender mediates the relationship between self-reported anger and aggression. However, gender was not revealed as a covariate in the logistic regression analysis. Other clinical and demographic characteristics were not revealed as potential covariates however; diagnosis variable consisted of either personality disorder, schizophrenia spectrum disorder or bipolar and related disorder categories which

can constitute variation within these broad ICD-10 codes. A future experimental study could involve a pre-and post-test with an anger treatment intervention. This would allow researchers and clinicians to establish whether there has been a reduction in scores in dynamic risk subscales on the SPJ tools and on an anger measure in the post assessment. But also, more importantly, whether there has been a reduction in inpatient aggression incidents following a targeted treatment intervention.

Clinical implications

An implication of this study is that patients self-reporting as part of the assessment for violent-risk, particularly on dynamic risk factors, should be encouraged where possible. In this study, patients only parted with information relating to anger as one risk factor which may or may not manifest in aggressive incidents. The main purpose of the NAS, as an anger assessment instrument, is to aid clinical case formulation for targeting treatment (Novaco, 2003) and studies have indeed found a reduction in assaults (Novaco & Taylor, 2015; Tew et al., 2012; Wilson et al., 2012). Other characteristics that may play a role in inpatient aggression, which have an identifiable treatment intervention, should also be sought from patients and included in the risk assessment and management plans. As advocated by Tait and Lester (2005), patient involvement in this manner could potentially even be therapeutic for the patient and in turn increase insight into the factors responsible for their aggressive behaviour. It could also help guide clinicians' decisions more effectively in the SPJ scheme in terms of the risk-level posed and for the identification of targeted treatment, for which progress could be monitored more closely and collaboratively with patients.

Conclusion

This study set out to determine whether there is any value in patients' self-reported anger in addition to clinical routine assessment of inpatient aggression-risk using SPJ tools,

such as the HCR-20 and START dynamic risk subscales. As dynamic risk factors are amenable to change through intervention, anger as one of many dynamic risk factors relevant to inpatient aggression should be addressed in terms of treatment. Although self-reported anger did not add incremental validity over clinician-rated risk factors in the prediction of inpatient aggression, in the interest of limited resources it may not be ideal to administer another assessment for this purpose. Items in the SPJ tools relating to the global evaluation of anger seem to adequately capture its association for inpatient aggression. Patients who score highly on anger-relevant items in the SPJ tools, might be prioritised for further anger-related assessment. The positive relationship between patients' self-reported anger and clinician-rated items in the dynamic risk subscales suggests targeted treatment interventions for anger could potentially reduce level of risk. It would thus be good practice to consider patient involvement where possible in violence-risk assessments for better informed risk management plans. This may facilitate increased self-awareness and insight into their unique set of risk factors, and in turn, become more compliant to engage in relevant treatment interventions to address and reduce their level of risk.

References

- Bowers, L., Nijman, H., & Palmstierna, T. (2007). The Attempted and Actual Assault Scale (Attacks). *International Journal of Methods in Psychiatric Research*, *16*(3), 171-176.
- Bowers, L., Stewart, D., Papadopoulos, C., Dack, C., Ross, J., Khanom, H., & Jeffery, D. (2011). Inpatient violence and aggression: A literature Review. Institute of Psychiatry, Kings College London.
- Bruton, J., Norton, C., Smyth, N., Ward, H., & Day, S. (2016). Nurse handover: patient and staff experiences. *British Journal of Nursing*, *25*(7), 386-393.
- Busner, J., & Targum, S. D. (2007). The Clinical Global Impressions Scale: Applying a Research Tool in Clinical Practice. *Psychiatry*, 29-37.
- Campbell, M. A., French, S., & Gendreau, P. (2009). The prediction of violence in adult offenders: a meta-analytic comparison of instruments and methods of assessment. *Criminal Justice and Behavior*, *36*, 567-590.
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155.
- Daffern, M., & Howells, K. (2009). The function of aggression in personality disordered patients. *Journal of Interpersonal Violence*, *24*(4), 586-600.
- Desmarais, S. L., Nicholls, T. L., Read, J. D., & Brink, J. (2010). Confidence and accuracy in assessments of short-term risks presented by forensic psychiatric patients. *The Journal of Forensic Psychiatry & Psychology*, *21*(1), 1-22.
- Dickens, G. L., & O'Shea, L. E. (2015). Predictive validity of the short-term assessment of risk and treatability (START) for aggression and self-harm in a secure mental health service: gender differences. *International Journal of Forensic Mental Health*, *14*(2), 132-146.
- DiGiuseppe, R., Tafrate, R. C. (2007). *Understanding anger disorders*. USA: Oxford University Press
- Doyle, M., & Dolan, M. (2006). Evaluating the validity of anger regulation problems, interpersonal style, and disturbed mental state for predicting inpatient violence. *Behavioural Sciences and the Law*, *24*, 783-798.
- Doyle, M., & Logan, C. (2012). Operationalizing the assessment and management of violence risk in the short-term. *Behavioural Sciences and the Law*, *30*, 406-419.
- Eivergard, K., Enmarker, I., & Hellzen, O. (2016). The talk about the psychiatric patient. *Issues in Mental Health Nursing*, *37*(10), 756-764.
- Field, A. (2013). *Discovering statistics using IBM SPSS statistics* (4th ed.). London: Sage Publications Ltd.
- Flood, C., Bowers, L., & Parkin, D. (2008). Estimating the costs of conflict and containment on adult acute inpatient psychiatric wards. *Nursing Economics*, *26*(5), 325-330.
- Ireland, J. L., Lee, J. P., Ireland, C. A., Chu, S., Kilcoyne, J., & Mulligan, C. (2016). Predicting hospital aggression in secure psychiatric care. *British Journal of Psychiatry Open*, *2*(1), 96-100.

- Jones, D., & Hollin, C. R. (2004). Managing problematic anger: the development of a treatment program for personality disordered patients in high security. *International Journal of Forensic Mental Health*, 3(2), 197-210.
- Kennedy, H.G. (1992). Anger and irritability. *British Journal of Psychiatry*, 161, 145-153.
- Khiroya, R., Weaver, T., & Maden, T. (2009). Use and perceived utility of structured violence risk assessments in English medium secure forensic units. *Psychiatric Bulletin*, 33, 129-132.
- McDermott, B. E., Edens, J. F., Quanbeck, C. D., Busse, D., & Scott, C. L. (2008). Examining the role of static and dynamic risk factors in the prediction of inpatient violence: variable-and person-focused analyses. *Law Hum Behav*, 32, 325-338.
- McDermott, B. E., Quanbeck, C. D., Busse, D., Yastro, & Scott, C. L. (2008). The accuracy of risk assessment instruments in the prediction of impulsive versus predatory aggression. *Behavioural Sciences and the Law*, 26, 759-777.
- Nonstad, K., Nettet, M. B., Kroppan, E., Pedersen, T. W., Nottestad, J., Almvik, R., & Palmstierna, T. (2010). Predictive validity and other psychometric properties of the short-term assessment of risk and treatability (START) in a Norwegian high secure hospital. *International Journal of Forensic Mental Health*, 9, 294-299.
- Novaco, R. W. (1986). Anger as a clinical and social problem. In R. J. Blanchard & D. C. Blanchard). *Advances in the Study of Aggression*, Vol. 2 (pp. 1-67). New York: Academic Press.
- Novaco, R. W. (2003). *The Novaco Anger Scale and Provocation Inventory (NAS-PI)*. Los Angeles: Western Psychological Services.
- Novaco, R. W. (2010) Anger and Psychopathology. In Potegal, M., Stemmler, G., & Spielberger, C. (Eds.). *International Handbook of Anger: Constituent and Concomitant Biological, Psychological, and Social Processes* (pp. 465-497). New York: Springer.
- Novaco, R. W., & Taylor, J. L. (2015). Reduction of assaultive behaviour following anger treatment of forensic hospital patients with intellectual disabilities. *Behaviour Research and Therapy*, 65, 52-59.
- Ogloff, J. R. P., & Daffern, M. (2006). The dynamic appraisal of situational aggression: an instrument to assess risk for imminent aggression in psychiatric inpatients. *Behavioural Sciences and the Law*, 24, 799-813.
- O'Shea, L. E., Mitchell, A. E., Picchioni, M. M., & Dickens, G. L. (2013). Moderators of the predictive efficacy of the historical, clinical and risk management-20 for aggression in psychiatric facilities: systematic review and meta-analysis. *Aggression and Violent Behavior*, 18, 255-270.
- Renwick, S. J., Black, L., Ramm, M., & Novaco, R. W. (1997). Anger treatment with forensic hospital patients. *Legal and Criminological Psychology*, 2, 103-116.
- Rice, M. E., & Harris, G. T. (2005). Comparing effect sizes in follow-up studies: ROC area, Cohen's d, and r. *Law and Human Behaviour*, 29(5), 615-620.

- Rippon, T. J. (2000). Aggression and violence in health care professions. *Journal of Advanced Nursing*, 31(2), 452-460.
- Rosnow, R. L., & Rosenthal, R. (2005). *Beginning behavioural research: A conceptual primer* (5th Eds.). Upper Saddle River, NJ: Pearson Hall.
- Singh, J. P., Desmarais, S. L., & Van Dorn, R. A. (2013). Measurement of predictive validity in violence risk assessment studies: A second-order systematic review. *Behavioral Sciences & the Law*, 31(1), 55-73.
- Singh, J. P., Grann, M., & Fazel, S. (2011). A comparative study of violence risk assessment tools: a systematic review and metaregression analysis of 68 studies involving 25, 980 participants. *Clinical Psychology Review*, 31, 499-513.
- Tait, L., & Lester, H. (2005). Encouraging user involvement in mental health services. *Advances in Psychiatric Treatment*, 11, 168-175.
- Tew, J., Dixon, L., Harkins, L., & Bennett, A. (2012). Investigating changes in anger and aggression in offenders with high level of psychopathic traits attending the chromis violence reduction programme. *Criminal Behaviour and Mental Health*, 22(3), 191-201.
- Uppal, G., & McMurrin, M. (2009). Recorded incidents in a high-secure hospital: A descriptive analysis. *Criminal Behaviour and Mental Health*, 19, 265-276.
- Vitacco, M. J., Van Rybroek, G. J., Rogstad, J. E., Yahr, L. E., Tomony, J. D., & Saewert, E. (2009). Predicting short-term institutional aggression in forensic patients: a multi-trait method for understanding subtypes of aggression. *Law Hum Behav*, 33, 308-319.
- Webster, C. D., Douglas, K. S., Eaves, D., & Hart, S. D. (1997). *HCR-20: Assessing Risk For Violence Version 2*. Vancouver: Mental Health Law and Policy Institute, Simon Fraser University.
- Webster, C. D., Martin, M., Brink, J., Nicholls, T. L., & Desmarais, S. L. (2009) *Short-Term Assessment of Risk and Treatability (START) Version 1.1*. BC Mental Health and Addiction Services, Coquitlam, British Columbia, Canada and St Joseph's Healthcare Hamilton, Ontario, Canada.
- Wilson, C., Gandolfi, S., Alison, D., Thomas, B., Tapp, J., & Moore, E. (2013). Evaluation of anger management groups in high-security hospital. *Criminal Behaviour and Mental Health*, 23(5), 356-371.
- World Health Organisation. (2011). *ICD-10 Classifications of Mental and Behavioural Disorder: Clinical Descriptions and Diagnostic Guidelines*. Geneva: World Health Organisation.
- Wykes, T., & Whittington, R. (1998). Prevalence and predictors of early traumatic stress reactions in assaulted nurses. *Journal of Forensic Psychiatry*, 9, 643-658.
- Yudofsky, S., Silver, J. M., Jackson, W., Endicott, J., & Williams, D. (1986). The overt aggression scale for the objective rating of verbal and physical aggression. *Am J Psychiatry*, 143, 35-39.

PATIENTS' SELF-REPORTED ANGER

Table 1. Participant demographics and characteristics

Characteristics of patient participants (N=76)	n (%)
Gender	
Female	38 (50.0)
Male	38 (50.0)
Ethnicity:	
Caucasian	52 (68.4)
Black	16 (21.1)
Asian	8 (10.5)
Primary diagnosis:	
Personality disorder	39 (51.3)
Schizophrenia spectrum disorder	32 (42.1)
Bipolar and related disorder	5 (6.6)
Security Level resided on:	
Low secure	51 (67)
Medium secure	25 (33)
Exhibited aggressive behaviour:	
Any aggression	34 (45.0)
Physical aggression	13 (17.0)
Age years (Mean [SD])	34.0 [11.6]

PATIENTS' SELF-REPORTED ANGER

Table 2. Independent samples *t*-tests of patient and clinician-rated differences on anger between exhibited/ not exhibited aggressive behaviours

Aggressive outcomes							
	Any aggression				<i>t</i> (<i>df</i>)	<i>P</i>	<i>r</i>
	Aggression (<i>n</i> =34)		No aggression (<i>n</i> =42)				
	<i>M</i> (<i>SD</i>)	95% <i>CI</i>	<i>M</i> (<i>SD</i>)	95% <i>CI</i>			
NAS Total	93.6 (16.5)	88.4, 99.0	86.8 (14.9)	82.2, 91.4	-1.89(74)	.06	0.22
HCR-20 Clinical Total	6.7 (2.1)	5.9, 7.3	4.9 (2.2)	4.2, 5.6	-3.52(74)	.00	0.38
C1	1.6 (0.6)	1.4, 1.8	1.3 (0.6)	1.1, 1.5	-1.85(74)	.07	0.20
C4	1.4 (0.7)	1.2, 1.7	1.2 (0.8)	1.0, 1.4	-1.35(74)	.18	0.15
C5	1.2 (0.6)	1.0, 1.4	0.8 (0.6)	0.6, 1.0	-2.39(74)	.02	0.27
HCR-20 Risk-M Total	6.4 (2.4)	5.6, 7.3	5.2 (1.9)	4.6, 5.7	-2.46(74)	.01	0.28
START Strength Total	21.0 (4.8)	19.4, 22.8	22.1 (4.9)	19.4, 22.8	0.94(74)	.34	0.11
START Vulnerability	22.3 (6.6)	20.1, 24.4	22.8 (8.7)	20.4, 25.3	0.32(74)	.75	0.04
(V) Total							
Emotional State (V)	1.3 (0.5)	1.1, 1.4	1.5 (0.5)	1.3, 1.7	2.10(74)	.04	0.24
Attitudes (V)	1.4 (0.6)	1.2, 1.6	1.2 (0.7)	1.0, 1.4	-1.25(74)	.21	0.15
Physical aggression only							
	Physical aggression		No physical aggression		<i>t</i> (<i>df</i>)	<i>P</i>	<i>r</i>
	<i>(n</i> =13)		<i>(n</i> =63)				
NAS Total	101.1 (15.8)	92.7, 110.0	87.5 (15.0)	84.2, 91.2	-2.94(74)	.00	0.32
HCR-20 Clinical Total	7.8 (1.4)	7.0, 8.5	5.3 (2.3)	4.7, 5.8	-3.80(74)	.00	0.40
C1	1.8 (0.3)	1.5, 2.0	1.3 (0.6)	1.2, 1.5	-2.39(74)	.02	0.27
C4	1.8 (0.4)	1.5, 2.0	1.2 (0.8)	1.0, 1.4	-2.53(74)	.01	0.28
C5	1.2 (0.6)	0.9, 1.5	0.9 (0.6)	0.8, 1.1	-1.52(74)	.13	0.17
HCR-20 Risk-M Total	6.7 (2.2)	5.4, 7.9	5.5 (2.2)	5.0, 6.1	-1.72(74)	.09	0.19
START Strength Total	18.9 (3.2)	17.1, 20.7	22.2 (5.0)	20.4, 24.3	2.24(74)	.03	0.25
START Vulnerability	24.1 (6.4)	20.6, 28.0	22.3 (8.0)	20.4, 24.3	-0.76(74)	.45	0.09
(V) Total							
Emotional State (V)	1.4 (0.5)	1.1, 1.7	1.4 (0.6)	1.4, 1.6	0.16(74)	.87	0.02
Attitudes (V)	1.4 (0.7)	1.0, 1.7	1.3 (0.7)	1.1, 1.4	-0.64(74)	.52	0.07

PATIENTS' SELF-REPORTED ANGER

Table 3. Pearson's r correlation between patients' self-reported anger and SPJ dynamic risk items and subscales

	1	2	3	4	5	6	7	8	9	NAS Total
1 HCR-20 Clinical Total		.80** [.69, .87]	.58** [.41, .72]	.71** [.62, .81]	.45** [.25, .63]	-.53** [-.67, -.37]	.43** [.22, .61]	.22 [.00, .41]	.40** [.21, .57]	.46** [.32, .60]
2 HCR-20 C1			.39** [.16, .57]	.57** [.41, .69]	.43** [.21, .62]	-.37 [-.56, -.15]	.37** [.14, .55]	.24* [.04, .42]	.31** [.10, .49]	.37** [.18, .55]
3 HCR-20 C4				.29* [.07, .50]	.30** [.10, .50]	-.60** [-.73, -.44]	.56** [.39, .70]	.57** [.43, .70]	.39** [.16, .62]	.42** [.25, .58]
4 HCR-20 C5					.35** [.16, .53]	-.34 [-.56, -.11]	.41** [.22, .58]	.17 [-.08, .37]	.35** [.15, .56]	.35** [.15, .52]
5 HCR-20 Risk-m Total						-.35** [-.53, -.18]	-.37** [.17, .55]	.23* [.03, .45]	.34** [.16, .52]	.23* [-.04, .48]
6 START Strengths Total							-.66** [-.77, -.53]	-.46** [-.61, -.29]	-.49** [-.67, -.28]	-.35** [-.52, -.17]
7 START Vulnerabilities (V) Total								.72** [.61, .81]	.70** [.57, .80]	.34** [.15, .53]
8 START Emotional state (V)									.49** [.32, .65]	.29* [.07, .47]
9 START Attitude (V)										.29* [.08, .48]

*p<.05 **p<.01 [95% Confidence Interval]

PATIENTS' SELF-REPORTED ANGER

Table 4. Predictive validity of the scales for any inpatient aggression, and physical aggression only

	Any aggression					Physical Aggression only				
	AUC	<i>p</i>	95% CI	Sensi- tivity	Speci- ficity	AUC	<i>p</i>	95% CI	Sensi- tivity	Speci- ficity
NAS Total	.64*	.04	.51, .77	0.64	0.33	.75**	.01	.60, .89	0.85	0.40
HCR-20 Clinical Total	.72**	.01	.61, .84	0.74	0.33	.81**	.00	.71, .92	1.00	0.41
HCR-20 Risk-M Total	.63*	.05	.50, .76	0.62	0.43	.66	.07	.48, .84	0.69	0.48
START Strengths Total	.56	.34	.43, .69	0.41	0.50	.69**	.01	.54, .83	0.31	0.49
START Vulnerabilities Total	.46	.58	.33, .59	0.47	0.50	.56	.52	.40, .71	0.46	0.54

AUC, area under receiver operating characteristic curve; CI, confidence interval

n = 76

p*<.05 *p*<.01

PATIENTS' SELF-REPORTED ANGER

Table 5. Logistic regression models for incremental predictive validity of patients' self-reported anger in aggressive outcomes using significant variables from ROC analyses

	B [95% CI]	OR (95% CI)
Any aggression		
Constant ^a	-2.89	
HCR-20 Clinical Total	0.32** [-0.14, 0.72]	1.38 (1.07, 1.77)
HCR-20 Risk-M Total	0.13 [-0.11, 0.44]	1.15 (0.89, 1.47)
Constant ^b	-3.33	
HCR-20 Clinical Total	0.30* [0.01, 0.74]	1.35 (1.02, 1.77)
HCR-20 Risk-M Total	0.13 [-0.21, 0.44]	1.14 (0.89, 1.47)
NAS Total	0.01 [-0.03, 0.05]	1.00 (0.97, 1.04)
Physical aggression only		
Constant ^a	-4.45	
HCR-20 Clinical Total	0.59** [0.24, 1.24]	1.82 (1.17, 2.82)
START Strength Total	-0.05 [-0.34, 0.15]	0.94 (0.78, 1.14)
Constant ^b	-6.88	
HCR-20 Clinical Total	0.52** [0.18, 1.18]	1.69 (1.07, 2.67)
START Strength Total	-0.05 [-0.32, 0.24]	0.95 (0.78, 1.16)
NAS Total	0.03 [-0.03, 0.10]	1.02 (0.98, 1.07)

* $p < .05$ ** $p < .01$, $n = 76$

Any aggression:

^aNote. $R^2 = .16$ (Cox & Snell) .21 (Nagelkerke). Model $\chi^2(1) = 12.88$ $p < .01$

^bNote. $R^2 = .16$ (Cox & Snell) .21 (Nagelkerke). Model $\chi^2(2) = 13.00$ $p < .01$

Note. $\chi^2(2) - \chi^2(1) = 0.12$ $p > .05$

Physical aggression only:

^aNote. $R^2 = .18$ (Cox & Snell) .30 (Nagelkerke). Model $\chi^2(1) = 15.15$ $p < .01$

^bNote. $R^2 = .20$ (Cox & Snell) .33 (Nagelkerke). Model $\chi^2(2) = 16.81$ $p < .01$

Note. $\chi^2(2) - \chi^2(1) = 1.66$ $p > .05$