Incremental Validity Analyses of the Violence Risk Appraisal Guide and the Psychopathy Checklist: Screening Version in a Civil Psychiatric Sample

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This study compares two instruments frequently used to assess risk for violence, the Violence Risk Appraisal Guide (VRAG) and the Psychopathy Checklist: Screening Version (PCL:SV), in a large sample of civil psychiatric patients. Despite a strong bivariate relationship with community violence, the VRAG could not improve on the predictive validity of the PCL:SV alone, even though the VRAG includes several ostensible violence risk factors other than psychopathy. Moreover, incremental validity analyses indicated that the remaining VRAG items accounted for little or no variance in violent outcomes once psychopathy scores were controlled. Conversely, the PCL:SV continued to account for considerable variance after controlling for the VRAG. These results reflect the limited validity of the VRAG items in civil psychiatric samples beyond the variance that is explained by the PCL:SV alone.

Keywords: violence; psychopathy; VRAG; psychiatric patients; risk assessment

Given the diversity of legal arenas in which clinicians are asked to assess the likelihood of violent behavior (Lyon, Hart, & Webster, 2001) and the far-reaching consequences of those assessments (e.g., Edens, Buffington-Vollum, Keilen, Roskamp, & Anthony, 2005), research examining the generalizability of risk assessment instruments beyond the specific settings in which they were developed is crucial. This is especially true of actuarial instruments that are statistically derived in a particular sample, involve complex scoring and weighting procedures, and include variables that may not be available or relevant across all types of settings (e.g., criminal history data). In addition to generalizability, another important factor to consider in relation to the clinical use of risk assessment instruments is the extent to which they demonstrate incremental validity (Douglas, Vincent, & Edens, 2006; more generally, see Hunsley, 2003). That is, to what extent can one instrument improve on the predictive validity of another instrument or assessment method?

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One risk assessment instrument that increasingly has been the focus of research attention over the past several years is the Violence Risk Appraisal Guide (VRAG; Quinsey, Harris, Rice, & Cormier, 1998). The VRAG combines information across 12 risk factors (e.g., psychopathy, alcohol problems, and marital status) that were found to contribute to the prediction of criminally violent behavior in a large sample of male forensic patients and criminal offenders from one region in Canada who had a history of serious violence. Examining the use of the VRAG in other samples and settings is critical for establishing the generalizability of the instrument, given the unique nature of the original sample and the complexity of scoring the risk factors (see Quinsey et al., 1998, pp. 237-290; and http://www.mhcp-research.com/bkerrors.htm for a list of corrections to various published scoring guidelines). Although impressive validity coefficients have been reported in some forensic and criminal samples, the ability of the VRAG to improve on other relevant risk factors (e.g., psychopathy) has been less consistently demonstrated (e.g., Cooke, Michie, & Ryan, 2001; Kroner & Mills, 2001; cf. Glover, Nicholson, Hemmati, Bernfeld, & Quinsey, 2002), and its clinical use in nonforensic and noncorrectional settings is relatively unknown.

Recently, Harris, Rice, and Camilleri (2004) reported important generalizability data regarding the predictive validity of the VRAG in a large civil psychiatric sample. They analyzed data from the MacArthur Violence Risk Assessment Study (Monahan et al., 2001), a study in which more than 1,000 psychiatric inpatients were assessed for more than 130 potential risk factors and then followed for 50 weeks after hospital discharge to assess their involvement in community violence. Harris et al. (2004) began by identifying items from the MacArthur database that they believed could serve as proxies for the 12 items contained within the VRAG. Some of the substitutions were relatively direct, for example, replacing the Hare Psychopathy Checklist–Revised (PCL-R; Hare, 1991, 2003) with its Screening Version (PCL:SV; Hart, Cox, & Hare, 1995). Others, however, appear to have involved greater inferential leaps because there were no corresponding variables in the MacArthur data set that exactly paralleled the VRAG item content (e.g., scoring past nonviolent offenses, given the noncriminal nature of the sample). For two items, Harris et al. (2004) were unable to identify any suitable proxies, which resulted in the creation of a modified 10-item VRAG.

Harris et al. (2004) assessed the association between the modified VRAG and community violence during 20- and 50-week follow-up periods, using receiver operating characteristic (ROC) analyses and Pearson correlations. The modified VRAG produced an area under the curve (AUC) of .72 (*SE* = .04) for violence within 20 weeks of hospital release. Results for other criterion measures of violence were similar (e.g., AUC for violence within 50 weeks = .70). Harris et al. concluded that their "results provide evidence about the robustness of comprehensive actuarial risk assessments and the generality of the personal factors that underlie violent behavior" (p. 1063).

Although these are important results, there are reasons to qualify this conclusion about the "robustness" of the VRAG. Foremost, in earlier analyses of the MacArthur data, Skeem and Mulvey (2001) reported that during the 50-week follow-up period, a single component of the modified 10-item VRAG (i.e., the PCL:SV) was associated with violent behavior to a comparable degree (AUC = .73) to what Harris et al. (2004) reported for the 10-item VRAG over this period (AUC = .70). Although these results support "the generality of the personal factors that underlie violent behavior" (p. 1063), they raise serious questions regarding the robustness and contribution of the rest of the VRAG. That a lone risk factor worked slightly better than the "comprehensive actuarial risk assessment" questions the need for the more elaborate procedure.

Given these earlier findings, in this study we compared directly the predictive use of the modified VRAG and the PCL:SV, based on the MacArthur data. The results reported by Harris et al. (2004) raise two meaningful statistical questions in light of those reported by Skeem and Mulvey (2001). First, does the nine-item modified VRAG (without the PCL:SV item) predict violence among psychiatric patients to any reasonable degree? Given the considerable resources required to score a PCL:SV (Monahan et al., 2001), the simplified VRAG sans PCL:SV might still be a useful instrument with civil psychiatric patients even if a PCL measure is unavailable for inclusion in a risk assessment. Second, can the VRAG account for any unique variance in violent outcomes beyond that predicted by the PCL:SV? Although the VRAG does not appear to explain any more variance in violent outcomes in the MacArthur study data than does psychopathy alone (even though a PCL measure is included in the scoring of the VRAG), that does not lead to the conclusion that the VRAG accounts for the same variance in these outcomes as does the PCL:SV. This issue is directly relevant for both comparing the predictive use of various risk assessment instruments and developing an understanding of the factors that explain the most variance in violence risk. Isolating key risk factors for violence is a crucial step toward informing strategies to reduce risk (Douglas & Skeem, in press). The purpose of the current article is to address directly these two lingering questions regarding the utility (basic and incremental) of these instruments for predicting violence in a civil psychiatric sample.

METHOD

The data analyzed in this study were collected as part of the MacArthur Violence Risk Assessment Study (available at http://macarthur.virginia.edu). The methodological details and primary results of the larger study are reported in detail elsewhere (Monahan et al., 2001). A total of 1,136 patients (71% of those invited to participate) were interviewed initially in one of three hospitals to assess a variety of risk factors. These participants were primarily young (M = 30 years, SD = 6), White (69%; African American, 29%; Hispanic, 2%), and male (59%); were voluntarily admitted (58%); and were patients with primary diagnoses of depression or dysthymia (40%), schizophrenia or schizoaffective disorder (17%), bipolar disorder (13%), substance abuse (24%), personality disorder (2%), or other disorder (4%). After patients were discharged, interviewers recontacted them in the community and interviewed them five times (every 10 weeks) during a 1-year period chiefly to obtain information about the patients' involvement in violence. Of the 1,136 patients enrolled in the study, 84% completed at least one follow-up interview, 72% completed three or more follow-up interviews, and 50% completed all five follow-up interviews.

A collateral informant (e.g., family member, friend, professional) for each patient was also interviewed on the same schedule. Violence was assessed by combining patient report, collateral report, and a review of official records. Violence was defined as battery that resulted in physical injury (ranging from bruises to death), sexual assaults, assaultive acts that involved the use of a weapon, or threats made with a weapon in hand. To reduce the difficulties inherent in validly measuring personality characteristics during the acute phases of an Axis I disorder (see Loranger et al., 1991), the PCL:SV was administered during Follow-ups 1 or 2. The PCL:SV consists of 12 items, half of which assess the interpersonal and affective traits of psychopathy (Factor 1) and half of which assess the impulsive and antisocial behavioral features often associated with psychopathy (Factor 2).

To identify relevant variables and participants in this study's database, we followed the description provided by Harris et al. (2004) for scoring and testing the modified VRAG. In some instances, the specific variables they used were unclear. The MacArthur study's database contains thousands of variables, and in some instances, several variables were potentially relevant indicators of a single variable included in the modified VRAG (e.g., multiple indices of substance use history and diagnoses). As such, we made some inferences in choosing the variables that seemed most relevant to scoring the items in this scale. Although we did not replicate exactly those chosen by Harris et al.,[1] our bivariate results are highly comparable to theirs (see below).

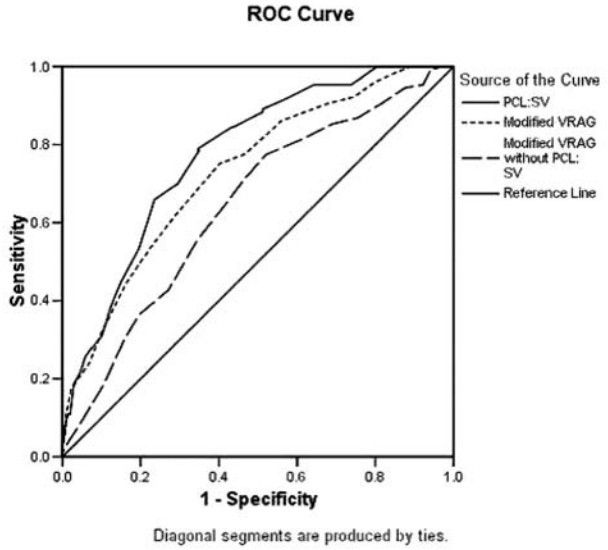
Participants were 695 individuals who had completed both the first two follow-up interviews in the community (n = 731) and the PCL:SV (n = 871). We used these selection criteria in an attempt to replicate the sample reported by Harris et al. (2004), although they identified a total of 741 participants using these criteria. The reason for this discrepancy (n = 695 vs. 741) is unclear to us, although the samples used in the two studies overlap considerably (94%). Base rates of at least one act of violence during the 20- and 50-week timeframes were 18.6% and 27.5%, respectively.

RESULTS

Using the occurrence of at least one violent act during the 20-week follow-up period as the outcome measure, ROC curves were constructed for the modified VRAG,[2] the PCL:SV, and the modified VRAG scored without the PCL:SV item (see Figure 1). Our scoring of the modified VRAG yielded an AUC of .73 (SE = .02, $p < .001$), which is quite similar to the value of .72 reported by Harris et al. (2004). By comparison, the AUC for the PCL:SV alone during this time period in the same subsample was .78 (SE = .02, $p < .001$). After removing the PCL:SV, the AUC for the modified VRAG was considerably degraded (.64, SE = .03, $p < .001$), although still significant. Using violence during the full 50-week follow-up period as the criterion, we obtained highly similar results (VRAG without PCL:SV, AUC = .64, $p < .001$; PCL:SV only, AUC = .76, $p < .001$).

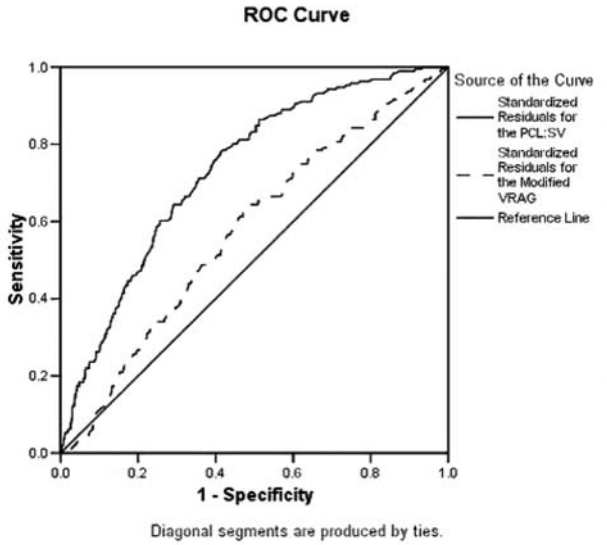
Next, we examined the potential incremental validity of each measure. To do so, two linear regression analyses were performed, whereby the modified nine-item VRAG (without the PCL:SV) was used to predict PCL:SV scores and the PCL:SV to predict the modified VRAG. The standardized residuals from these analyses represent the unique, independent variance of each measure beyond that of the other (i.e., variance in the VRAG independent of PCL:SV scores and vice versa; for a similar example, see Buffington-Vollum, Edens, Johnson, & Johnson, 2002). We then performed ROC curve analyses on these residuals (see Figure 2). The AUC for the modified VRAG independent of the PCL:SV was only .58 (SE = .03, $p < .01$). In contrast, the variance attributable to the PCL:SV independent of the VRAG was strongly associated with violent acts (AUC = .75, SE = .02, $p < .001$). Similar results were obtained for the 50-week follow-up period as well (AUCs of .57 vs. .73, respectively).[3]

FIGURE 1
Classification Accuracy of the Psychopathy Checklist: Screening Version (PCL:SV), the Modified Violence Risk Appraisal Guide (VRAG), and Modified VRAG Without the PCL:SV



NOTE: ROC = receiver operating characteristic.

FIGURE 2
Classification Accuracy of the Modified Violence Risk Appraisal Guide (VRAG) After Controlling for the Psychopathy Checklist: Screening Version (PCL:SV) and of the PCL:SV After Controlling for the Modified VRAG



NOTE: ROC = receiver operating characteristic.

Aside from dichotomous violent-nonviolent outcome criteria, the MacArthur data set also provides information regarding the number of violent incidents that occurred during the follow-up period. Given that Harris et al. (2004) reported the association between the modified VRAG and the number of violent acts during the 20-week follow-up period, we conducted partial correlations on this outcome to address incremental validity. The results here were even more striking. Although the zero-order association between the modified VRAG sans PCL:SV and violent incidents was .22, after controlling for PCL:SV scores it was essentially uncorrelated with this outcome (partial $r = .04$). Conversely, the bivariate correlation between the PCL:SV and the number of violent acts ($r = .31$) was almost unchanged after controlling for the modified VRAG sans PCL:SV (partial $r = .29$). We obtained highly similar effects when examining the 50-week follow-up period as well (VRAG partial $r = .05$; PCL:SV partial $r = .30$).

DISCUSSION

This study yielded two main findings. First, the association between the modified VRAG and violent acts among psychiatric patients is statistically significant yet modest once the traits tapped by the PCL:SV are controlled. Second, the validity of the modified VRAG was attributable primarily to 1 of its 10 items—the PCL:SV. In our view, these findings echo a growing body of research suggesting that the most robust correlates of violence include personality factors[4] and that these risk factors are germane across both psychiatric and nonpsychiatric samples. They do not, however, suggest that the use of the VRAG generalizes broadly and strongly to other samples (beyond the fact that it taps variance that can be explained by measures such as the PCL:SV). Thus, the claims of Harris et al. (2004) regarding the use of the VRAG in civil psychiatric settings seem to be significantly overstated.

Generic traits of antagonism are among the most generalizable risk factors for future violence (Skeem, Miller, Mulvey, Tiemann, & Monahan, 2005). These traits can be captured with self-report measures or with Factor 2 of the PCL:SV. For example, Skeem et al. (2005) demonstrated that self-reported antagonism, assessed via the NEO-FFI (Costa & McCrae, 1989) Agreeableness scale, was a robust correlate of violent behavior in the MacArthur sample and that it performed comparably to Factor 2 of the PCL:SV. Similarly, the Antisocial Features scale of the Personality Assessment Inventory (Morey, 1991) correlates strongly with measures of antagonistic traits and is also a robust predictor of various forms of aggressive and violent institutional behavior among criminal offenders

(e.g., Edens & Ruiz, in press; see also Walters, in press, for an overview of other relevant measures).

If one intends to use the PCL:SV, there seems little justification for going beyond it to assess and score the 9 other items of the modified VRAG, at least in the civil psychiatric context. Although the modified VRAG has 10 items, it was unable to improve meaningfully on a single risk factor included within it, the PCL:SV. Interestingly, this finding has some counterparts in correctional samples similar to the one in which the VRAG was developed. For example, in the calibration sample (Harris, Rice, and Quinsey, 1993), adding 11 variables to the PCL-R only raised the multiple correlation from .34 to .44, indicating the dominant role played by psychopathy. In another large-scale study, Cooke et al. (2001) reported that the VRAG could not improve on the predictive validity of the PCL-R among Scottish prison inmates—both in terms of predicting institutional misconduct and recidivism risk once released into the community. We should note, however, that some studies with smaller samples have reported evidence of incremental validity for the VRAG relative to PCL-R-defined psychopathy in isolation (e.g., Glover et al., 2002).

Because this research examined a modified version of the VRAG, it could be argued that its performance relative to traits captured by the PCL:SV was underestimated (Harris et al., 2004). Although it is not possible to assess directly the effects of omitting two variables that were included in the original instrument (failure on conditional release and worst injury during index offense), it seems unlikely that adding these items would markedly improve the performance of the VRAG in this civil psychiatric sample, particularly relative to that of the PCL:SV. Although a potentially large subgroup of patients with histories of arrest would be eligible to fail on conditional release, this item is more broadly applicable to offenders rather than psychiatric patients.

The more general point raised by our findings is that risk assessment research needs to move toward systematic incremental validity analyses to inform consideration about unique associations between predictor measures and violence (Douglas et al., 2006). For example, in a study comparing the HCR-20 (Webster, Douglas, Eaves, & Hart, 1997) violence risk assessment scheme to the PCL:SV in a civil psychiatric sample, Douglas, Ogloff, Nicholls, and Grant (1999) found that the HCR-20 (with psychopathy removed) added to the use of the PCL:SV in predicting violence, but the reverse was not true (betas for the HCR-20 and PCL:SV were .37 and .05, respectively). In contrast, in the large scale study of Scottish offenders noted earlier (Cooke et al., 2001), neither the HCR-20 nor the VRAG outperformed the PCL-R in the prediction of criminal recidivism or institutional misconduct. As an aside, we should note that many self-report measures have demonstrated some evidence of incremental validity over structured risk assessment instruments (and vice versa) in the prediction of various forms of social deviance, particularly self-report scales focusing on those "antagonistic traits" noted earlier (Walters, in press), suggesting that risk assessments might be improved in some instances by incorporating diverse assessment methodologies.

This study also raises broader questions about the limits of the generalizability of actuarial violence risk instruments.[5] An appealing feature of such measures is their promotion of consistency in the decision-making process. However, this process is not immune from error or subjective judgment. Researchers and clinicians may be limited in their capacity to apply consistently the scoring rules for the VRAG when available data do not map clearly onto those variables used to derive the scale. Despite our familiarity both with the VRAG and the MacArthur data set, we did not identify exactly the same variables as Harris et al. (2004), even though we were using information and labels specific to a particular data set. Although our bivariate results were not widely discrepant from what Harris et al. reported, it seems clear that clinical inference is required to select which variables are needed to score the risk factors that make up this actuarial inventory.

Concerns along these lines were voiced decades ago by Sawyer (1966), who noted that there is more to the clinical-actuarial distinction than simply the method of combining existing data. There are also clinical and mechanical modes of collecting data. Little attention has been paid to the potential unreliability of clinicians and researchers at the data collection stage. In the case of the VRAG, deciding exactly which variables to code from archival data may be more of a clinical than mechanical enterprise, depending on the type and quality of file information available. As such, interrater reliability on data collection for actuarial measures cannot be presumed to be uniformly high, particularly when data used to score the individual items are derived from settings or file information that differs from those in which the tool was developed. Despite these concerns in relation to civil psychiatric settings, we should note that there is evidence that the VRAG can be scored reliably when used with Canadian offender samples (e.g., Harris, Rice, Quinsey, Lalumiere, Boer, & Lang, 2003; Kroner & Mills, 2001).

In conclusion, these results offer little support for the robustness of the VRAG in this civil psychiatric sample but do bolster earlier findings about the generality of key personality features when considering risk for violence. Contrary to the conclusions drawn by Harris et al. (2004), there appears to be little gained by scoring the VRAG for psychiatric patients beyond what can be gleaned from the PCL:SV or other measures of violence-relevant personality traits.

APPENDIX
MacArthur Variables Used to Score the Modified Violence Risk Appraisal Guide (VRAG)

VRAG Item	*MacArthur VRAS Variable*
Lived with parents to age 16	q5.1 and q5.2
Elementary school maladjustment	neu1.2 or neu1.3; sidp1.c (dichotomized); sidp1d (dichotomized); sidp1g (dichotomized)
Alcohol problems	dsm15a (dichotomized); dsm15b (dichotomized); drug1c (dichotomized); q5.12a.1 & q5.12b1 (dichotomized); q5.18a.1 & q5.18b.1 (dichotomized); od6ax1d1 – od6ax1d5; od6ax2d1 – od6ax2d5
Marital status	q2.12 or q2.16
Nonviolent offense history	proparr
Age	dsmage
Victim sex	admitinc
Personality disorder	od6az2d1 – od6ax2d5
Schizophrenia	od6ax1d1 – od6ax1d5
Psychopathy	pcltot

NOTE: Algorithms used to combine variables, whereby multiple variables are listed for an item, are available from the authors by request. VRAS = violence risk assessment study.

NOTES

1. We contacted the lead author of the Harris, Rice, and Camilleri (2004) article to determine precisely how each modified Violence Risk Appraisal Guide (VRAG) item was scored, that is, which variables were selected for each item and how they were combined into a score. The authors provided a list of variables that suggested we had selected an overlapping, but not identical, set of variables (G. Harris, personal communication, October 22, 2004). However, we could not use the list to rerun our analyses because (a) variables listed for several items could not be reconciled with the items to be scored (e.g., because they were string variables or variables that were redundant with one another) and (b) no instructions for combining variables were provided. Because our VRAG findings were slightly stronger than Harris et al.'s results, we retained our scoring procedure. We have been in communication with Harris et al. to obtain a usable list of variables and algorithms but, as of this writing, have yet to receive this information.

2. Rather than using a simple linear conversion to rescale the scores to the same values as the Hare Psychopathy Checklist–Revised (PCL-R; i.e., multiplying Psychopathy Checklist: Screening Version [PCL:SV] scores by 1.667), we used a process derived from item response theory analyses to convert PCL:SV scores to the metric equivalent of PCL-R scores (for details, see Cooke, Michie, Hart, & Hare, 1999). These converted PCL:SV scores were then recoded to reflect how the VRAG weights PCL-R scores (e.g., scores ranging from 5 through 9 = –3). Although it is unclear whether Harris et al. (2004) used such a procedure when recoding the PCL:SV to estimate the PCL-R, it is of little practical significance, because the Cooke et al. (1999) conversions led to results that were almost identical to those obtained when performing a linear conversion of the PCL:SV.

3. We obtained similar results when conducting sequential logistic regression analyses to compare the incremental use of each measure. The addition of the modified VRAG to a model that included the PCL:SV significantly improved model fit, $\chi^2(1, n = 695) = 14.79$, $p < .001$, but only increased the amount of variance explained by 3%. In contrast, the addition of the PCL:SV to a model that included the modified VRAG increased the variance explained by 17%, $\chi^2(1, n = 695) = 79.84$, $p < .001$.

4. By "personality," we do not mean to imply Factor 1 of the PCL, which previously has been shown to be less relevant to violence risk than Factor 2 in this particular sample (Skeem & Mulvey, 2001). More generally, Factor 2 typically is a stronger correlate of various forms of aggression and socially deviant conduct than is Factor 1 (Douglas, Vincent, & Edens, 2006; Edens, in press; Edens, Campbell, & Weir, 2005; Gendreau, Goggin, & Smith, 2002; Guy, Edens, Anthony, & Douglas, 2005; Walters, 2003).

5. Along these same lines, Monahan et al. (2005) recently published cross-validation data for the commercially available actuarial device developed from the MacArthur data set, the Classification of Violence Risk (Banks et al., 2004). It is of note that the area under the curve values, although statistically significant and of sufficient magnitude to be of some practical value (.63-.70, depending on the criterion used), were substantially degraded in comparison to what had been reported in the derivation studies (.88).

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