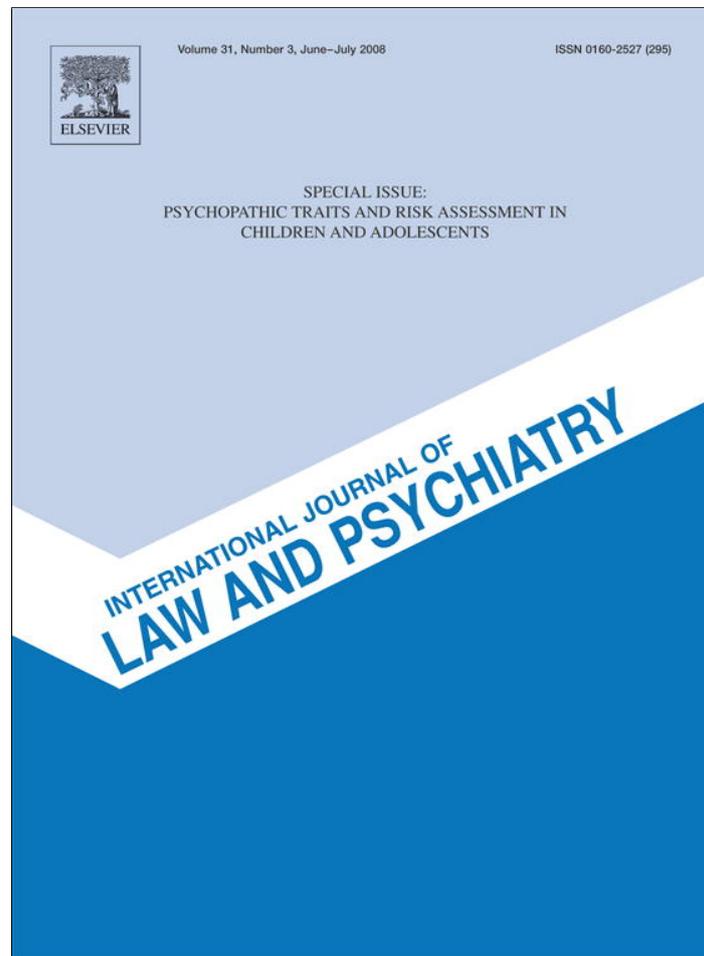


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## Predictive validity of the Structured Assessment of Violence Risk in Youth (SAVRY) during residential treatment

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### ABSTRACT

This prospective study examines the predictive validity of the Dutch version of the Structured Assessment of Violence Risk in Youth (SAVRY) by examining relationships between SAVRY scores and various types of disruptive behavior during residential treatment. The SAVRY, a risk assessment instrument, was coded for 66 male adolescents on the basis of file information and interviews. The adolescents were referred to Rentray, a juvenile correctional and treatment facility, by the Dutch juvenile courts because of severe behavioral problems or serious offenses. Institutional infractions were retrieved from incident registration files, which included acts of physical violence, verbal threat, verbal abuse, and violation of institutional rules. The interrater reliability of the SAVRY scores was good. The predictive validity of the SAVRY for physical violence against persons was excellent (Risk Total: AUC=.80,  $r=.33$ ; Summery Risk Rating: AUC=.86,  $r=.48$ ). The SAVRY also had good predictive validity for violence against objects, verbal threats and violations of rules, but not for verbal abuse. Implications for assessment and management of violent behavior among adolescents in residential treatment are discussed.

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### 1. Introduction

The [American Academy of Child and Adolescent Psychiatry \(2005\)](#) recently recommended that all youth referred to correctional institutions be evaluated for current and future risk of violent behavior. This necessitates that risk assessment tools for juvenile offenders be developed and validated. Also, Article 2 of the Dutch Principle Act on juvenile justice institutions, concerning the rights of incarcerated juveniles, states that the atmosphere within the institutions should be positive in order to resocialize and prepare the youths for their return to society ([Dutch Ministry of Justice, 2001](#)). However, thus far, no validated risk assessment instrument for adolescents has been available in The Netherlands.

Violence and aggression are serious problems in Dutch correctional and treatment facilities for adolescents. Prior studies ([Dienst Justitiële Inrichtingen, 2001](#)) have found annual incidence rates in treatment facilities of 37% for violence against peers and 42% for violence against staff. Violence often causes physical injury, and the threat of violence induces fear and uncertainty in patients as well as staff, interfering with the therapeutic climate. Given the serious consequences for staff and other patients, preventing aggression in juvenile institutions is critical.

Preventing residential violence requires that adequate risk assessment and management strategies be implemented. Risk assessment entails a systematic appraisal of risk, need, and protective factors ([Hoge, 2002](#); [Hoge & Andrews, 1996](#)). Unstructured risk assessments often result in decisions that are inaccurate, inequitable, and lacking in accountability ([Hoge, 2002](#)). One reason

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for these problems is that, without proper structure, evaluators tend to rely on factors that do not have a demonstrable relationship to violence recidivism and overlook other factors that do predict (Borum, 1996).

Risk assessments conducted with juvenile offenders are different from, and in some ways more complicated than those with adults (Hoge, 2002; Hoge & Andrews, 1996). There are a number of reasons for this: base rates for violence are different; risk factors are different and less stable; behavioral norms are different; and psychosocial maturity is more central (Borum, 2000, 2003). Even among youth themselves, predictors of violent behavior vary by developmental stage. For example, “during childhood, individual characteristics and family risk factors are most important. Later, during adolescence, peer group and school risk factors become important” (Howell, 1997, p. 164). Very few risk assessment tools exist, which incorporate and address the developmental considerations necessary for use with adolescents. Although more than 50 years of research in the field of behavioral sciences has identified the key risk factors for violent offending in juveniles (Borum, 2000; Howell, 1997; Lipsey & Derzon, 1998), there have been few attempts to apply this knowledge base to structure offender risk assessments.

Three recently developed instruments have shown some degree of promise in structuring assessments of risk and protective factors in offenders between the ages of twelve and nineteen (Borum, 2003). The first is the Youth Level of Service/Case Management Inventory (YLS/CMI; Hoge & Andrews, 2002). This inventory consists of 42 items and focuses on risk for general recidivism, not for violence in particular. The second is the Psychopathy Checklist: Youth Version (PCL:YV; Forth, Kosson, & Hare, 2003). This checklist consists of 20 items reflecting characteristics associated with the construct of psychopathy, including an antisocial and impulsive lifestyle, deficiencies in guilt and empathy, and egocentric and manipulative interpersonal behavior. Although, the PCL:YV is not a risk assessment instrument per se, it measures a number of personality traits that are associated with increased violence risk. Nevertheless, a handful of studies have demonstrated significant associations between PCL:YV scores and adolescent inpatient violence (Murrie, Cornell, Kaplan, Mc Conville, & Levie Elkon, 2004; Stafford & Cornell, 2003). The third instrument is the Structured Assessment of Violence Risk in Youth (SAVRY, Borum, Bartel, & Forth, 2002). The SAVRY was designed specifically for assessing violence risk, and is the instrument examined in the present study.

Risk assessment instruments can be divided into actuarial and structured professional judgment (SPJ) instruments. In several studies, the SPJ method has outperformed the actuarial method of risk assessment, both in research with adults (Dempster, 1998; De Vogel, De Ruiter, van Beek & Mead, 2004b) and with adolescents (Bartel, Borum, & Forth, 2000). In both the actuarial and SPJ models, the evaluator systematically assesses a set of predetermined risk factors that have demonstrated significant empirical relationships with (violent) offenses in prior research. The essential difference between the actuarial and the SPJ approach is in how the final risk judgment is made. For actuarial instruments, the decision is made mechanically according to a fixed algorithm. For SPJ instruments, it is made by the professional evaluator based on a structured assessment (Otto, 2000). In the SPJ method, the evaluator not only rates and sums the items, but also uses personal expertise and knowledge to interpret, combine and weigh the risk factors to arrive at a summary or final risk judgment.

The YLS/CMI and the SAVRY are SPJ instruments. However, in contrast to the YLS, the SAVRY manual explicitly advises against the use of numerical indices and cut-off points in clinical decision making. The SAVRY Risk Total is used only for research purposes. The Risk Total is derived by numerically transforming and summing codes of Low, Moderate, and High for the 24 risk items, to 0, 1, and 2, respectively. In clinical applications, the Summary Risk Rating is used. This rating is the final professional judgment, based on an overall interpretation of the 24 risk items and the 6 protective items of the case. This Summary rating is not linked to a particular score or range of scores.

Although past findings have been promising, further research is needed to study the predictive validity of the SAVRY with regard to inpatient disruptive behavior. In the present study, the strength of the association is examined in a sample of Dutch adolescents in a juvenile justice treatment facility. On the basis of prior research, which will be discussed further on in the Method section, we hypothesize that:

- (1) The SAVRY Summary Risk Rating and the SAVRY Risk Total have good predictive validity for disruptive behavior, in particular for physical aggression against persons.
- (2) The SAVRY Summary Risk Rating outperforms the SAVRY Risk Total in terms of predictive value.
- (3) The SAVRY protective factors add incremental value to the risk assessment based solely on risk factors.

## 2. Method

### 2.1. Setting

The present study was conducted in Rentray, a correctional and treatment facility for male and female juveniles between 12 and 22 years of age. Youth are placed under a so-called “PIJ” order (Placement In a Juvenile justice institution) or a supervision order by the juvenile court, because of serious offenses and/or serious behavioral problems. Treatment methods vary widely, and include individual cognitive therapy, group therapy, expressive therapy, offense chain/psychoeducational treatment, anxiety and aggression management, impulse control training, drug and alcohol treatment, social skills training and family therapy.

Rentray runs a number of open, semi-secure and secure units in The Netherlands. The present study was conducted in the semi-secure treatment units. Semi-secure means that after 8 weeks of observation in a secure setting, the adolescent can earn supervised leave and later unsupervised visits to the nearest town, depending on his conduct, followed by visits to his parents every 2 weeks.

### 2.2. Subjects

The current sample included 66 boys admitted to Rentray between January 2001 and January 2003. The mean age at admission was 15.4 years ( $SD=1.6$ ; range 12–18). In terms of ethnic origin, 62% were Caucasian Dutch, 17% were Surinamese/Antillean, 10%

were Mediterranean and 11% were of other descent. Mean IQ was 92 (SD=11; range 60–110). All boys had a history of violence; otherwise they were excluded from this study. However, not all their violent acts had resulted in criminal conviction. Before admission, 70% had official convictions; about two-thirds for violent offenses (e.g., attempted homicide, aggravated assault, robbery, rape) and one third for non-violent offenses (e.g., theft, arson). About 77% came from another secure facility before admission to the semi-secure units of Rentray.

### 2.3. Instruments

The SAVRY is a risk assessment tool based on the structured professional judgment model and intended for use with adolescents (Borum et al., 2002). The structure of the SAVRY is modeled on existing risk assessment protocols for adults such as the Historical, Clinical, Risk Management-20 (HCR-20; Webster, Douglas, Eaves, & Hart, 1997), but its item content focuses on risk factors relevant to adolescents. Each risk factor is coded for severity on a three-point scale, but the final appraisal of risk level is determined by the examiner's professional judgment—not solely based on a summation of the items. In this way, the structured assessment draws on the strengths of both the clinical and actuarial approaches to risk decision making.

The SAVRY guideline is composed of 24 risk items, divided into three domains (historical, social/contextual and individual) and a protective domain with six items (see Table 1). The risk items have a three-level coding structure (low, moderate, and high) and the protective items have a two-level structure (absent or present). Specific coding guidelines are provided for each item and each level. The psychometric properties of the SAVRY are promising. Using trained student raters, the single rater intraclass correlation coefficient (ICC) was .81 for the SAVRY Risk Total score and .77 for the Summary Risk Rating (Catchpole & Gretton, 2003). Comparably, McEachran (2001) found relatively high interrater reliability (.83) for the SAVRY Risk Total and moderate coefficients (.72) for the Summary Risk Rating.

In the initial validation sample (Bartel et al., 2000), SAVRY Risk Total scores were significantly related to measures of institutional aggressive behavior ( $r=.40$ ) and aggressive conduct disorder symptoms ( $r=.52$ ). Protective factors were negatively

**Table 1**

Items of the SAVRY

#### *Historical items*

1. History of violence
2. History of non-violent offending
3. Early initiation of violence
4. Past supervision/intervention failures
5. History of self-harm or suicide attempts
6. Exposure to violence in the home
7. Childhood history of maltreatment
8. Parental/caregiver criminality
9. Early caregiver disruption
10. Poor school achievement

#### *Social/contextual items*

11. Peer delinquency
12. Peer rejection
13. Stress and poor coping
14. Poor parental management
15. Lack of personal/Social support
16. Community disorganization

#### *Individual items*

17. Negative attitudes
18. Risk taking/impulsivity
19. Substance use difficulties
20. Anger management problems
21. Low empathy/remorse
22. Attention deficit/hyperactivity difficulties
23. Poor compliance
24. Low interest/Commitment to school or work

#### *Protective items*

- P1. Prosocial involvement
- P2. Strong social support
- P3. Strong attachments and bonds
- P4. Positive attitude towards intervention and authority
- P5. Strong commitment to school or work
- P6. Resilient personality

Note. From Borum et al. (2002).

related to these outcomes. In other studies, significant correlations have been found between SAVRY Risk Total scores and measures of violence among young male offenders in Canada (Catchpole & Gretton, 2003; Gretton & Abramowitz, 2002) and among high-risk Native American Youth (Fitch, 2002). SAVRY Summary Risk Ratings have also been found to correlate significantly with outcome measures of community violence (Gretton & Abramowitz, 2002; McEachran, 2001). Using Receiver Operating Characteristic (ROC) analysis, Areas under the Curve (AUCs) for the SAVRY Risk Total average between .74 and .80 across studies. Interestingly, the examiner overall risk judgment (summary risk rating) consistently performs as well as, and often better than the actuarial combination of the scores. For example, using ROC analysis, McEachran (2001) found an AUC for the SAVRY Risk Total of .70, but the AUC for the SAVRY Summary Risk Rating was .89.

The Dutch version of the Psychopathy Checklist: Youth Version (*Psychopathie Checklist: Jeugd Versie*; PCL:JV; De Ruiter, Kuin, De Vries, & Das, in press) was used to measure psychopathic traits. The 20 items of the PCL:JV are scored on a three-point rating scale (0 = item does not apply, 1 = item applies to a certain extent, 2 = item definitely applies), resulting in a dimensional total score ranging from 0 to 40. For a more detailed description and the psychometric qualities of the PCL:YV, we refer to the article of Das, De Ruiter & Doreleijers (2008).

In the SAVRY Consultation Edition, a PCL:YV score was necessary to code item 21 (Psychopathic Traits). This item has been modified in the current version (Version 1.1), so that the PCL:YV is no longer a formal requirement for coding the SAVRY. Given that items from the SAVRY and PCL:YV show substantial overlap, the SAVRY authors sought to construct an item that captured some of the variance in the cluster of traits known to be associated with increased risk of violence and aggression. The "Low Empathy/Remorse" item is the product of these efforts. They examined whether the modification of item 21 would affect the SAVRY Risk Total. Accordingly, they took the sum of PCL:YV items 6 (Lack of remorse) and 8 (Callous/Lack of empathy) and divided it by two. They found no substantial differences with the original definition of item 21. We used the same formula to code item 21. Because we had already decided to use the PCL:YV in the present research project, we will make use of the PCL:YV total score for comparative purposes.

#### 2.4. Procedure

We conducted interviews and reviewed files for 70 adolescent males referred during the first 8 weeks of their stay. The adolescents were monitored for violent incidents from week eight until their discharge from the institution (average treatment duration = 22 months; range = 7–23; SD = 11). Four juveniles were excluded because they stayed in Rentray for less than 6 months. All files contained reports by social workers and psychological and psychiatric reports with information on family and school contexts, developmental characteristics of the adolescent, treatment plans, and court decisions. Trained interviewers conducted structured interviews according to the guidelines for the PCL:YV (Forth et al., 2003). This interview closely parallels the semi-structured interview for the adult version of the PCL-R (Hare, 1991, 2003), with some items modified for use with adolescents. The Dutch language version of the SAVRY (Lodewijks, Doreleijers, De Ruiter, & De Wit-Grouls, 2003) was coded on the basis of all information available at week eight after admission.

The two raters were Master level psychologists, trained in coding the SAVRY and PCL:YV during a two-day workshop given by a senior clinical psychologist (the first author). This workshop reviewed the relevant empirical literature and provided practice cases for coding the SAVRY and PCL:YV using file information and videotapes of actual cases. Raters were instructed to use the SAVRY and PCL:YV manual and all available file information for all cases.

To establish the interrater reliability, each rater independently coded the first 16 cases (24%). Subsequently, both raters met, discussed their ratings, and agreed upon a consensus rating and the final risk judgment. After the training and consensus meeting, each rater independently coded half the remaining files. The 16 consensus SAVRY ratings, and the 50 single rated SAVRYs were used for subsequent analyses of predictive validity.

#### 2.5. Disruptive behavior during residential treatment

Data on institutional disruptive behavior were retrieved from incident files. These files were completed by group leaders and checked by their supervisors before entry into an electronic database. Supervisors only report incidents if they are deemed serious enough to require corrective action (e.g., extra chores to be done, time out, solitary confinement). Using a previously developed classification scheme (see: Hildebrand, De Ruiter, & Nijman, 2004), we classified the nature and target (to peers, to staff or to oneself) of the incident as: (1) Verbal abuse (e.g., cursing); (2) Verbal threats (e.g., threatening to hit or to stab someone with a knife); (3) Violence against objects (e.g., damaging furniture); (4) Physical violence against persons (e.g., hitting someone, throwing objects at a person); and (5) Violation of institutional rules (e.g., use of drugs, unauthorized absence). After an interrater reliability check on 100 randomly selected incidents, which proved to be nearly perfect (observed agreement = 92%; Cohen's  $\kappa = .88$ ), an independent research assistant not engaged in the SAVRY coding recorded incidents for each adolescent according to the classification scheme.

We focused especially on incidents of physical violence directed towards persons, since this category of behavior is the SAVRY's principal focus. We further classified incidents of physical violence against persons to correspond to the definition of violence used in the SAVRY manual: "an act of battery or physical violence that is sufficiently severe to cause injury to another person or persons (i.e., cuts, bruises, broken bones, death, etc.) regardless of whether injury actually occurs; any act of sexual assault; or a threat made with a weapon in hand. In general, these acts should be of sufficient severity that criminal charges either did, or could have, resulted" (Borum et al., 2002, p. 29).

To determine whether the SAVRY was able to predict related types of disruptive behavior, we also considered verbal threats, verbal abuse, violence against objects and violation of institutional rules. Because the length of stay in the institution was not equal for all youth, all the dependent variables were corrected for time at risk.

## 2.6. Data analysis

Interrater reliability was assessed by means of the Intraclass Correlation Coefficient (ICC), using the two-way random effects variance model and consistency type (McGraw & Wong, 1996). We used the following critical values for single measure ICCs:  $ICC \geq .75$  = excellent;  $.60 \leq ICC < .75$  = good;  $.40 \leq ICC < .60$  = moderate;  $ICC < .40$  = poor (Fleiss, 1986). Predictive validity was assessed by using Receiver Operating Characteristics (ROC) analyses (Mossman, 1994; Rice & Harris, 1995). One advantage of this statistical method is that the measure of classification accuracy is not affected by the base rate of violence. ROC analyses result in a plot of the true positive rate (sensitivity) against the false positive rate (1 minus specificity) for every possible cut-off score of the instrument. The resulting Area Under the Curve (AUC) can be interpreted as the probability that a randomly selected offender would score higher on the instrument than a randomly selected non-offender. An AUC of .50 represents chance prediction, and an AUC of 1.0 perfect prediction. In general, AUC values of .70 and above are considered moderate, and above .75 good (Douglas, Guy, & Weir, 2005). To compare the obtained AUC values, we used AccuROC version 2.5 (Vida, 1997). Pearson *r* correlations were calculated to allow comparison with similar studies in this area. Stepwise linear multiple regression analyses were conducted to assess which SAVRY items and domains were significant predictors of the violent outcome variable. All statistical analyses were conducted using SPSS version 13.0.

## 3. Results

### 3.1. Interrater reliability

The interrater reliability of the SAVRY domains and SAVRY Risk Total ranged from good to excellent (single measure ICC: Risk Total = .74, Historical = .74, Social/Contextual = .61, Individual = .82 and Protective = .86). The interrater reliability of the Summary Risk Rating was excellent (ICC = .85). In no case did one rater judge 'high risk' while the other judged 'low risk'. Three items – Past supervision/Intervention failure, Peer delinquency, and Poor parental management – demonstrated only moderate interrater reliability (ICCs = .54, .57 and .52, respectively). The overall interrater reliability of the PCL:YV was good (ICC total score = .74).

### 3.2. Physical violence and other disruptive behavior

During the study period, (January 2001–May 2005), a total of 1296 incidents was recorded. The average number of incidents per adolescent was 19.6 (SD = 20.1, range 0–117). Only two adolescents (3%) were not involved in any recorded incident. The mean frequency of incidents per juvenile per year was 10.3.

With regard to type of incident, 13.6% involved physical violence against persons, 5.7% violence against objects, 7.7% verbal threats, 9.6% concerned verbal abuse and 63.4% involved rule violations. The base rate during residential treatment for violence against objects was 16%, for physical violence against persons 48%, for verbal threats 55.2%, for verbal abuse 59%, and for violation of institutional rules 92%. Most of the physical violence against persons (78%) was classified as mildly serious and 22% was serious because a person was wounded. Peers were the victims in 60% of the incidents, staff members in the remaining 40%. There were five incidents of sexual violence and eleven incidents of self-harm.

### 3.3. SAVRY and PCL: YV outcomes

The mean SAVRY Risk Total was 23.7 (SD = 6.5, range 12–41), with 10.7 on the historical domain (SD = 3.2, range 2–19), 5.5 on the social contextual domain (SD = 2.4, range 1–11), 7.8 on the individual domain (SD = 3.5, range 1–15), and 1.3 on the protective domain (SD = 1.0, range 0–4). Highest rates of missing data occurred for item 6 (10%; 'Exposure to violence in the home') and item 8 (8%; 'Parental/Caregiver criminality').

**Table 2**

Predictive validity of the SAVRY and PCL:YV for physical violence against persons (N = 66)

	AUC	SE	<i>r</i>
Historical domain	.58	.07	.01
Social/contextual domain	.66*	.07	.12
Individual domain	.88***	.04	.58**
Risk total	.80***	.05	.33**
Protective domain	.13***	.04	-.41**
Summary risk rating	.86***	.05	.48**
PCL:YV	.68*	.07	.26*

Note. AUC = Area Under the Curve. SE = Standard Error. *r* = Pearson correlation coefficient.

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$  (two-tailed).

**Table 3**  
Predictive validity of the SAVRY items for physical violence against persons (N=66)

	AUC	SE	r
<i>Historical items</i>			
1. History of violence	.52	.07	.04
2. History of non-violent offending	.49	.07	.02
3. Early initiation of violence	.59	.07	.03
4. Past supervision/intervention failures	.52	.07	.10
5. History of self-harm or suicide attempts	.54	.07	.20
6. Exposure to violence in the home	.45	.08	-.10
7. Childhood history of maltreatment	.40	.07	-.30
8. Parental/caregiver criminality	.45	.08	-.11
9. Early caregiver disruption	.69	.07	.18
10. Poor school achievement	.53	.07	.00
<i>Social/contextual items</i>			
11. Peer delinquency	.53	.07	.19
12. Peer rejection	.57	.07	-.10
13. Stress and poor coping	.62	.07	.16
14. Poor parental management	.47	.07	-.23
15. Lack of personal/social support	.56	.07	.10
16. Community disorganization	.63	.07	.12
<i>Individual items</i>			
17. Negative attitudes	.77***	.06	.29*
18. Risk taking/impulsivity	.65*	.07	.36**
19. Substance use difficulties	.60	.07	.36**
20. Anger management problems	.74**	.06	.27*
21. Low empathy/remorse	.70**	.07	.31*
22. Attention Deficit/hyperactivity difficulties	.63	.07	.36**
23. Poor compliance	.81***	.05	.40**
24. Low interest/commitment to school	.75**	.06	.25*
<i>Protective items</i>			
P1. Prosocial involvement	.53	.07	.11
P2. Strong social support	.35*	.07	-.08
P3. Strong attachments and bonds	.33*	.07	-.20
P4. Positive attitude towards intervention	.35*	.07	-.29*
P5. Strong commitment to school	.28**	.06	-.38**
P6. Resilient personality	a	a	a

Note. AUC = Area Under the Curve. SE = Standard Error. r = Pearson correlation coefficient. a = cannot be calculated because this variable is always absent. \*p < .05, \*\*p < .01, \*\*\*p < .001 (two-tailed).

When a PCL:YV cut-off score of 26 was applied to a categorical diagnosis of psychopathy, 12% of the adolescents met the criterion. Hare (1991) suggested a cut-off score of 30 or more. In European research, however, a cut-off score of 26 is often used (e.g. Grann, Långström, Tengström, & Stålenheim, 1998; Hildebrand et al., 2004; Rasmussen, Storsæter, & Levander, 1999).

Prior to the main study we examined whether SAVRY Total Risk and the SAVRY Summary Risk Rating were related to age, ethnic origin or intelligence level of the subjects. Chi square analyses revealed no significant differences.

### 3.4. Predictive validity

The SAVRY exhibited good predictive validity for physical violence against persons in the institution: all AUC values and Pearson rs for the SAVRY Risk Total, the individual domain, the protective domain and the Summary Risk Rating were good (see Table 2).

**Table 4**  
Predictive validity of the SAVRY for different types of disruptive behavior

	SAVRY Total Risk			SAVRY Summary Risk Rating		
	AUC	95% CI	r	AUC	95% CI	r
Physical violence against persons	.80***	.69–.91	.33**	.86***	.77–.95	.48**
Violence against objects	.76***	.64–.87	.32**	.74***	.62–.86	.27*
Verbal threats	.65*	.51–.79	.13	.74***	.61–.86	.36**
Rule violations	.92**	.85–.99	.18	.87**	.77–.96	.20
Verbal abuse	.58	.44–.73	.35**	.62	.44–.73	.30*

Note. AUC = Area Under the Curve. 95% CI = 95% confidence interval. r = Pearson correlation coefficient. \*p < .05, \*\*p < .01, \*\*\*p < .001 (two-tailed).

**Table 5**  
Stepwise regression analysis of physical aggression against persons

Step	R square change	F change	df	Significance F change
1: Risk total scores	.21	17.05	1, 64	.000
2: Total protective scores	.23	25.69	1, 63	.000

Note. R square is the degree of variance explained at each step.  $F = F$  statistic.  $df =$  degrees of freedom.

The predictive validity for the historical and the social/contextual domains was found to be moderate. The predictive validity of the PCL:YV for physical violence against persons was also moderate. The AUC value for the professional judgment-based SAVRY Summary Risk Rating (.86) was higher than for the item-based SAVRY Risk Total (.80). However, this difference is not significant (AccuROC  $Z = .85$ ,  $p = .20$ ).

Next, we wanted to examine how the individual SAVRY items performed in predicting institutional violence. Table 3 shows AUC values and Pearson correlations for the SAVRY items and physical violence against persons. None of the items from the historical and social/contextual domains showed significant AUC values. Of the items from the individual domain, item 17 (Negative attitudes), item 18 (Risk taking/Impulsivity), item 20 (Anger management problems), item 21 (Low empathy/remorse), item 23 (Poor compliance), and item 24 (Low interest/Commitment to school) had significant AUC values and correlations. In the protective domain, items P2 (Strong social support), P3 (Strong attachments and bonds), P4 (Positive attitude towards intervention), and P5 (Strong commitment to school) had significant AUC values.

Stepwise regression analysis was applied to identify which items were most predictive of physical violence against persons. In the final model, items 23 (Poor compliance), 22 (ADHD), 20 (Anger management problems), and 7 (Childhood history of maltreatment) were the most significant predictors, with an adjusted  $R^2$  of 0.50, meaning that these four items accounted for 50% of the variance in the prediction of physical violence ( $F = 13.617$ ,  $p < .0001$ ).

We also calculated AUC values for the Total Risk score and Summary Risk Rating in relation to the different types of disruptive behavior studied (see Table 4). We found significant predictive accuracy of the SAVRY scores for violence against objects, verbal threats and violation of rules, but not for verbal abuse. Apparently, although the SAVRY was developed for the prediction (and prevention) of physical violence against persons, the instrument also has predictive value for other types of disruptive behavior as well.

Next, as summarized in Table 5, we conducted a series of stepwise regression analyses (forced entry) on physical aggression against persons. In Step 1, we entered the Risk Total score. When the total score of the protective factors was allowed to enter the model at Step 2, the prediction of physical violence against persons significantly improved over Step 1. This result was in line with our hypothesis.

#### 4. Discussion

This is the first prospective study into the SAVRY's ability to predict violent and other disruptive behavior in a semi-secure treatment facility for juvenile offenders in The Netherlands. The results of this study provide strong support for the structured professional judgment model of risk assessment in general and for the SAVRY in particular. No systematic bias was found in total risk scores or final risk judgments with regard to age, ethnic origin or intelligence level.

We found the SAVRY to be a strong predictor of incidents of physical violence against persons during residential treatment. The AUC values for the SAVRY Summary Risk Rating and SAVRY Risk Total were excellent (AUC = .86 and .80, respectively). These findings resemble findings from another study with a comparable sample (Bartel et al., 2000). The SAVRY also had good predictive validity for violence against objects, verbal threats and rule violations, so its usefulness is not necessarily limited to the prediction of physical violence against persons.

Although the Summary Risk Rating, a professional judgment not made on the basis of any fixed cut-off scores, turned out higher than the simple summation of the SAVRY scores in terms of predictive accuracy, the difference between the two ratings was not significant. This result is not in line with the finding that structured professional judgments predict better than actuarial scores, which has been shown in research with other structured professional judgment tools (Borum, Bartel, & Forth, 2005; Douglas et al., 2005; De Vogel, De Ruiter, Hildebrand, Bos, & van de Ven, 2004a).

With respect to the predictive accuracy of the different SAVRY domains, we found the highest predictive values for the individual and protective domains and no predictive value for the historical domain. Only Gretton and Abramowitz (2002) reported on the predictive value of the different SAVRY domains. They found a significant correlation between the historical domain and violence after release. A possible explanation for this difference in findings is that the variance for the historical domain in our sample was not large enough. This explanation should be rejected, however, because the mean Historical score was 10.6 with a standard deviation of 3.2. Thus, the risk factors from the historical domain seem less relevant in predicting violence against persons in a residential treatment facility in comparison to the dynamic risk and protective factors. Several studies with adult forensic psychiatric patients have reported similar findings. For instance, De Vogel and De Ruiter (2006) found that a lower number of the historical items of the HCR-20 risk assessment guideline were predictive of physical violence during intramural treatment, compared to a higher number of the dynamic risk factors. Similar findings were reported by Belfrage, Fransson, and Strand (2000) and Strand, Belfrage, Fransson, and Levander (1999). Furthermore, none of the individual historical and social/contextual items yielded significant predictions, while most of the individual and protective items did.

These results suggest that protective factors can add incremental value to risk assessment. Just as there are risk factors that increase the risk of violence, there are protective factors that can reduce the negative impact of a risk factor. This study supports the notion that protective factors should be integrated into risk management planning to enhance risk reduction.

Several limitations of the present study deserve attention. First, the sample size of the study was somewhat small, but this has not prevented the attainment of significant and clear findings. Another limitation concerns the fact that data collection was restricted to only one treatment facility. Therefore, caution is warranted regarding the generalizability of the findings. There is no reason to believe, however, that the Rentray population is fundamentally different from those of other Dutch juvenile justice treatment facilities with respect to demographic and clinical characteristics of the adolescent population (Van den Elzen, 1999; Vreugdenhil, Doreleijers, Vermeiren, Wouters, & Van den Brink, 2004).

Although the accurate assessment of violence risk is, of course, imperative, it is equally important to propose interventions likely to decrease this risk. The results of the multiple regression analyses suggest that, treatment interventions that enhance compliance and decrease anger management problems might be useful. Evidence based interventions aimed at these treatment targets are, for example, Functional Family Therapy (Alexander & Sexton, 2002) and Anger Replacement Training (Goldstein, Glick, & Gibbs, 1998).

Based on our findings and clinical experience, we would like to conclude with a recommendation for the use of the SAVRY in forensic practice. Although clearly stated in the SAVRY manual, we emphasize that raters should be properly trained to perform risk assessments with the SAVRY. Especially, the coding of the protective items needs attention. It is important to emphasize that these items are intended as mitigating or buffering factors, notable for their presence in the context of risk factors. In the SAVRY, protective factors are “conceptualized as variables that reflect involvement with and commitment to conventional society, that control against non-normative activities, and that refer to activities incompatible with normative transgression” (Jessor, van der Bos, Vanderryn, Costa, & Turbin, 1995, p. 931).

Given the relatively limited research that has been conducted on institutional adjustment in adolescents, these findings are important because they support a risk assessment model that can assist treatment staff in making appropriate decisions with respect to treatment needs as well as potential for disruptive behavior. More research with different (e.g., females) and larger samples in different settings (schools, youth psychiatric hospitals) should be conducted to further support the scientific status of the instrument in the prediction of violence in adolescents.

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