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Predictive Validity of the SAVRY within a Diverse Population of Juvenile Offenders

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Master of Arts

Forensic Psychology

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Signature Page

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Abstract

The current study examined the predictive validity of the SAVRY in African American and White recently adjudicated juvenile offenders in Louisiana. The sample consists of 267 community-based, male juvenile offenders, whom were tracked for an average follow-up period of 18 months. Receiver operating characteristic (ROC) analyses on the overall sample and African Americans, specifically, showed the numeric score predicted recidivism. Chi-square analyses found the SRR did not have a significant relationship with reoffending for general recidivism petitions. However, it was significant for all other forms of recidivism in the overall sample and African Americans. Hierarchical Cox regressions identified significant differences in time to reoffenses (all forms and contexts) and SAVRY scores. The study concludes that the SAVRY shows promise as a cultural invariant risk assessment tool that can predict general and violent recidivism for African American juveniles, although additional research is required to more confidently support such a claim.

The Predictive Validity of the SAVRY within a Diverse Population of Juvenile Offenders

The Office of Juvenile Justice and Delinquency Prevention (OJJDP) released a national report in May 2012 indicating that 1.5 million cases were processed through the juvenile justice system in 2009 (Puzzanchera, Adams, & Hockenberry, 2012). Racial breakdown that year in the United States showed 78% of the juvenile population was White, 16% African American, 5% Asian, and 1% was American Indian (juveniles of Hispanic ethnicity can be included in any race, although most are classified under “White,” according to the report). Despite African American juveniles accounting for less than 20% of the population in 2009, over one-third of delinquency cases involved these youth, while White juveniles represented only 64% of delinquency cases that year. These statistics represent the continued existence of Disproportionate Minority Contact (DMC) in the juvenile justice system. This national phenomenon has been considered by the Juvenile Justice Delinquency Act of 2002, which required an examination of minority youth at all decision points in the juvenile justice system for potential disproportionate representation (see section 223(a)(22)).

Risk assessments of future violence in juveniles are frequently conducted to help guide decision points such as those for detainment, interventions, disposition, and supervision requirements. In fact, the juvenile justice system saw over a two-fold increase in the use of risk assessments between 1990 and 2003 (Griffin & Bozynski, 2003; Towberman, 1992). Comprehensive risk assessments that accurately determine risk of reoffending are considered necessary to guide effective rehabilitation (Andrews, Bonta, & Hoge, 1990; Grisso, Vincent, & Seagrave, 2005). The full potential utility of a risk assessment tool cannot be realized when such instruments are invalid or do not capture risk equally across diverse groups.

Extant literature provides much information concerning adult risk assessments of violence, but less attention has been afforded to the psychometric properties of such assessments for juveniles (Borum, 2000; Schwalbe, 2007), such as predictive and incremental validity (Welsh, Schmidt, McKinnon, Chattha, & Meyers, 2008). Even less common are studies investigating the utility of juvenile risk assessments in consideration of race. Use of a risk assessment with a population for which it is not predictive does not allow appropriate classification of risk level of the offender and thus has the potential to inaccurately guide all decisions based on the tool's results. It may also serve to exacerbate racial disparities that continue to permeate the juvenile justice system (Schwalbe, Fraser, & Day, 2007), potentially resulting in deleterious effects on said system (Grisso et al., 2005), such as the "cumulative disadvantage" of compounded racial biases, as referenced by Rodriguez (2010).

The predictive validity of the risk assessment is therefore central to its utility in decision-making for juvenile offenders. Related to predictive validity is the generalizability of the risk factors identified in the assessment as it applies to diverse populations of juvenile offenders. Proper use of an assessment tool thus requires predictive validity that has been shown for the specific population that is being assessed. Research by Singh, Grann, and Fazel (2010) supports this notion. Following a systematic review and metaregression analysis, the researchers identified nine frequently used forensic risk assessment tools for adults and juveniles, from 68 studies and nearly 26,000 participants. Upon analysis of predictive validity for each instrument, their findings strongly supported increased confidence in risk assessment tools that were designed for more specific considerations. This conclusion was based on two observations: 1) tools measuring risk for violent offending held more predictive validity than those assessing general offending, and, 2) tools developed for more specific populations showed higher indices

of predictive validity than those aimed at capturing risk across a wider range of ages. Caution is therefore warranted and highly recommended when using risk assessment tools with populations that differ from their validation samples.

It is noteworthy that much research to date on juvenile risk assessment tools has investigated predictive validity under “contrived” situations, such that researchers use only file information to rate the tool and analyses are then conducted to assess its accuracy in recidivism prediction (Catchpole & Gretton, 2003; Gammelgard, Koivisto, Eronen, Kaltiala-Heino, 2008; Meyers & Schmidt, 2008). In consideration of this issue, research using “field” raters of the risk assessment tools, that afford attention to racial differences in predictive validity, will add significant value to the existing body of literature regarding the utility of these instruments.

Racial Differences and Predictive Validity of Juvenile Risk Assessments

Studies examining the racial differences in the predictive validity of juvenile risk assessment tools are few in number. However, the research that exists has shown the predictive validity of some juvenile risk assessments to differ based on race/ethnicity (Flores, Travis, & Latessa, 2003; Schwalbe et al., 2007; Vincent, Chapman, & Cook, 2011). Alternatively, some studies merely capture observable racial differences between juvenile offender scores, but do not measure or comment on the instrument’s predictive validity.

One study that investigated the predictive validity of the Youth Level of Service Inventory/Case Management Inventory (YLS/CMI; Hoge & Andrews, 1996) used a sample of Native Americans and Whites (Jung & Rawana, 1999). The YLS/CMI is a risk assessment tool originally developed for adolescents ages 12-17, and it examines risk through 42 items categorized into eight domains (Hoge & Andrews, 1996). While seven of the domains highlight criminogenic need and static risk factors, one domain, attitudes/orientation, is unique in that it

measures “responsivity factors” designed to identify characteristics predictive of an unfavorable response to intervention. Prior research has found predictive validity correlations within the range .25-.36 (Schmidt, Hoge, & Gomes, 2005; Thompson & Putnins, 2003). From their research, Jung and Rawana (1999) were able to report that the predictive validity of the assessment did not differ across race/ethnicity for Native Americans and Whites. In contrast, newer research from 2003 (Flores et al.) looking at racial differences only, frequently observed discrepancies between White and nonwhite (African American, Asian, and Other) adolescent offenders in Ohio, such that over two-thirds of item endorsements differed across five separate domains. Predictive validity of the YLS/CMI was examined again recently by Bechtel, Lowenkamp, & Latessa (2007). Bechtel and colleagues observed that, within a large sample ($n = 4,482$) of White and nonwhite (primarily African American) juveniles also in Ohio (with community and institutional sentences), significant support could be afforded to the instrument in predicting recidivism for juvenile offenders in both sentencing contexts, over a one-year follow-up period.

The North Carolina Assessment of Risk (NCAR) is another tool in which predictive validity was examined across White and African American adolescents. The tool was developed in a collaborative effort by researchers at the University of North Carolina, the Department of Juvenile Justice and Delinquency Prevention (DJJDP), and the National Council on Crime and Delinquency (NCCD). Using a large sample of 9534 participants, Schwalbe, Fraser, Day, & Cooley (2006) observed lower levels of predictive validity for African American juveniles compared to non-Latino White juveniles. In 2007, Schwalbe and colleagues revised the NCAR through an expansion of the scope of measured risk, in efforts to improve predictive validity for African American youths. Schwalbe et al. (2007) thus examined the predictive validity of the

expanded version of the tool with a sample of 536 court-involved juveniles, expecting improvements in predictive validity for African American youths. Compared to the original NCAR, the expanded version displayed greater predictive validity across the whole sample, representing a reduction in race/ethnicity differences.

The Psychopathy Checklist: Youth Version (PCL:YV; Forth, Kosson, & Hare, 2003) is a tool created to measure the construct of psychopathy specifically in adolescents aged 12-18. Previous research has reported significantly higher scores for African American juveniles over Caucasian counterparts in an institution sample (Forth et al., 2003). In more recent literature focusing on the predictive validity of the PCL:YV, the effect of ethnicity was considered in a small sample of 127 adjudicated community-based offenders in Canada (Schmidt, McKinnon, Chattha, & Brownlee, 2006). Across a 3-year follow-up period, results showed no differences in terms of the prediction of general recidivism for Native Canadians and Caucasians, but discrepancies appeared for violent recidivism, such that the tool was not able to accurately predict violent recidivism for Caucasians as well it did for Native Canadians.

The aforementioned research serves to highlight the variability in data regarding the accuracy of risk assessments tools for diverse juvenile offender populations. While best practices encourage the use of risk assessments to guide justice decisions, such as dispositions and intervention referrals, much trepidation is required when using a measure on populations on which they have not been normed. Empirical evidence indicates some tools fail to perform up to the standards of others, and thus have less to offer in terms of functionality. Generally speaking, meta-analyses have offered support for the utility of juvenile risk assessment in predicting recidivism and subsequently guiding decision points (Schwalbe, 2007; Singh et al., 2010), although much validation remains yet to be obtained for diverse populations of offenders.

The Structured Assessment of Violence Risk in Youth (SAVRY)

The SAVRY (Borum, Bartel, & Forth, 2006) is a risk assessment tool developed to predict risk of violence in juveniles between 12 and 18 years old, using a structured professional judgment (SPJ) model. The goal of the SAVRY is to assist professionals in making informed, accurate, assessment of violence risk, as a means to guide intervention and case management decisions. Using the Historical Clinical Risk-20 (HCR-20; Webster, Douglas, Eaves, & Hart, 1997) as a model of SPJ protocol addressing adult violence risk, the SAVRY developers considered research focused on risk of violence specifically in adolescents. The focus was to create a tool that systematically addressed all domains of risk and protective factors using empirically founded research, and could be used in a flexible and practical way to assess risk of violence, while also providing implications for treatment.

The resulting tool included 24 empirically-derived youth violence risk factors. Six protective factors are also incorporated, as they can have mitigating effects on the risk factors. According to manual guidelines and following consideration of these items and the degree to which they are present, an overall judgment for risk of violence is made. Due to the inclusion of dynamic risk factors in the tool, the SAVRY may also be sensitive to detecting change within individual risk items, and potentially overall risk. The measure does not utilize “cut-off” scores.

The SAVRY manual reports good interrater reliability for the total score (.83) and an acceptable value for the Summary Risk Rating (SRR; .72). Regarding the SRRs, Borum et al. (2006) maintain that they show a significant relationship to violent offending and, further, that they may even perform better than other risk assessment tools for juveniles. In 2009, Borum and colleagues discussed six studies investigating the interrater reliability of the SAVRY, showing very good intraclass correlation coefficients for numeric scores (.81 to .97) and moderate to

excellent values for SRR (.72 to .95). The majority of studies to date, however, report these figures based on SAVRYs rated through file information, by masters-level clinicians or researchers (Catchpole & Gretton, 2003; Lodewijks, Doreleijers, Ruiters, & Borum, 2008). Concurrent validity was established using the YLS/CMI and PCL:YV, further supporting the utility of the SAVRY as a risk assessment tool for juveniles (Borum, 2000).

The SAVRY's Predictive Validity. In order to investigate the short-term predictive validity of the SAVRY, researchers conducted file reviews to rate the assessment on a sample of 208 male and female institutionalized adolescents (in general resident psychiatry, correctional schools, or forensic units for adolescents) in Finland (Gammelgard et al., 2008). Psychiatric diagnoses of the participants ranged from psychotic disorders to conduct disorder. Results supported a fair level of predictive ability of the SAVRY total score for the six-month follow-up window for the total sample, as indicated by an AUC figure of .71 (95% CI = .63-.79). In terms of the three subscales, a range of poor (social/contextual; AUC .58) to fair (individual & historical; AUC .69 and .70, respectively) predictive validity was observed. They further identified that in their sample, a high SRR was significantly related to violent behavior, but not a moderate SRR. The authors suggest this finding may be explained through the ability of institutions to control aggression to a better degree than non-institutional settings. This study did not report any interrater reliability, as it was not obtained.

In a contrasting sample of community-based offenders, 111 Native Canadian and Caucasian juvenile boys and girls were rated on the SAVRY on the basis of file information (Welsh et al., 2008). Although the SAVRY was not intended to assess risk for nonviolent or general reoffending (either violent or nonviolent), the researchers chose to consider them. Receiver operating characteristic (ROC) analyses were conducted and revealed the SAVRY to be

a significant predictor of general and violent recidivism (AUC values of .77 and .81, respectively), and even outperformed the PCL:YV and YLS/CMI predictive indices, in a follow-up period averaging 3 years.

Meyers and Schmidt (2008) further examined the SAVRYs predictive ability, this time as it applies to 121 detained White and Native Canadian juvenile offenders, at one-year and three-year follow-up periods. Their findings indicate the SAVRY total score to be a good predictor of violent recidivism for both follow-up periods, as supported by AUC values of .66 (95% CI = .54 to .77; one-year follow-up) and .77 (95% CI = .67 to .87; three-year follow-up). They noted that the rates of reoffending did not greatly differ between moderate risk and high-risk youth during the one-year follow-up, but were more pronounced in the three-year follow-up period. This suggests that the SAVRY may be more sensitive to predicting recidivism in the context of longer durations of time.

Again expanding beyond assessing just violent recidivism, nonviolent offenses (defined as all offenses that did not meet the SAVRY manual's criteria for violent offenses) were captured. The SAVRY total score (as well as the SRR) was found to significantly predict general recidivism (either violent or nonviolent) for both follow-up periods: AUC .75, 95% CI .66 to .84 (one-year follow-up), AUC .76, 95% CI .67 to .84 (three-year follow-up). Focusing on nonviolent recidivism only, the SRR failed to predict for the three-year follow-up but was able to do so for the one-year follow-up. The total numeric score was able to fairly predict this type of recidivism within the three-year follow-up (AUC .68, 95% CI .57 to .80). Very strong predictive validity was observed for the one-year follow-up of nonviolent recidivism (AUC .80, 95% CI .68 to .91). The authors note that although the small sample size could limit the strength in

interpretation of their findings, results of this study are comparable to past research on the SAVRYs predictive ability and further support its use in juvenile risk assessment.

Racial Differences and the SAVRY. Using the SAVRY, researchers assessed risk of violence in a total sample of 757 male and female youth admitted to juvenile detention facilities in Connecticut between 2002 and 2003 (Chapman, Desai, Falzer, & Borum, 2006). Participants were mostly African American (39%) but Whites followed close behind at 36% of the sample. The SAVRY was adopted for use in risk assessment in Connecticut in 2002, and the raters for this study were human service workers, specifically trained in the tool by its principal developer. Although predictive validity was not examined, SAVRY results showed that African American youth were significantly more likely to be identified as low risk than White youth. Additionally, the African American youth generally held more protective factors than White youth, including resilient personality traits, prosocial involvement, and strong attachments and bonds. Based on their findings, the authors propose that a tool such as the SAVRY that uses a SPJ model may have the ability to reduce disproportionate minority contact.

Vincent et al. (2011) were the first to investigate the predictive validity of the SAVRY in terms of racial differences, using a sample of 480 male adolescents in one of three secure detention facilities in Connecticut in 2003. The racial/ethnic breakdown of the participants was relatively even: 36% were White, 38.8% African American, 23.5% Latino, and 1.6% classified as Other. An advantage over previous studies using only file review methods to score the SAVRY, this study had access to SAVRYs administered by juvenile justice personnel trained in the tool. Following an uncharacteristically long follow-up period (five years and four months), arrest records were collected and SAVRY scores (numerical and SRR) were analyzed to examine the tool's ability to accurately predict recidivism for Whites, African Americans, and Latinos.

Vincent and colleagues (2011) discovered a small degree of variability across racial/ethnic groups in the prediction of reoffending, such that the SAVRY total numeric score was not able to significantly predict nonviolent recidivism for racial/ethnic minority youth. However, for violent reoffenses, the predictive power of the numeric score was not affected by race-ethnicity. Looking at SRRs in African American youths, scores were related to higher rates of nonviolent arrest, even though this contradicts the numeric score. A final discovery was that individual domains within the SAVRY did not represent differential predictive validity, in terms of racial-ethnic groups. The researchers concluded that, in most respects, the SAVRY appears to work equally well for African American and Latino youths as it does for White youths.

Current Study

The current study aims to expand the existing literature on the predictive validity of the SAVRY in the context of race, using a sample of adjudicated African American and White male juvenile offenders obtained from three probation offices in Louisiana, tracked for an average of 18 months. This study is unique and has a significant advantage over previous research as the SAVRYs were rated by probation officers specifically trained in its administration. The predictive validity of the SAVRY is thus being tested in the field, as opposed to within a laboratory using file review methods. Additionally, the participants were not obtained from detention centers or institutions; they are community-based juveniles.

Data for this research were obtained from a larger study conducted by Dr. Gina Vincent: The Risk/Needs Assessment Implementation Study, a quasi-experimental, pre-post test design with control groups and a two year follow-up, designed to examine the outcomes of implementing valid risk/needs assessment tools in juvenile probation offices. Although the SAVRY, by design, is intended to measure risk of violence, this study will also examine the

SAVRY's ability to predict general recidivism (any form of recidivism) through the inclusion of nonviolent and violations recidivism (trespassing or probation violations, for example) data in this offense type. The general research question for investigation considered the ability of the SAVRY in predicting future reoffending (general and violent types) across races. From this, the hypotheses developed were as follows:

- 1) Significant differences will be observed between White juveniles and African American juveniles on the SAVRY total numerical score and SRR.
- 2) SAVRY total numerical score will predict recidivism
- 3) SRR will predict recidivism
- 4) The SAVRY will predict recidivism for all racial groups, although it will be less effective at predicting recidivism for African American juveniles than for White juveniles.

Additionally, an exploratory examination of time to reoffend will be conducted, comparing the juveniles based on racial background.

Method

Sample

The initial sample for this study consisted of 452 delinquent juveniles referred to one of three Louisiana probation offices post-adjudication between 2009 and 2011. The current study is derived from a larger one: The Risk/Needs Assessment in Juvenile Probation: Implementation Study, created by Dr. Vincent. Female youths ($n = 125$) were excluded because their small proportion with respect to the number of male youths, could threaten the accuracy of this study's findings. Thus, 327 male youths were left. Additional youths were excluded if they did not receive a SAVRY administration ($n = 30$), if they did not have an opportunity to reoffend (they

were in placement/custody for the entire duration of the follow-up period; $n = 9$), or if they recidivated prior to their first SAVRY administration ($n = 15$). Lastly, six youths whom self-identified as bi-racial were excluded to avoid confounding factors. The final sample resulted in 267 youth, with age ranging from 5 to 17.21 ($M = 14.59$, $SD = 1.88$). African Americans were over represented in the sample (79.8%, $n = 213$ vs. Whites, 20.2%, $n = 54$).

Measures

SAVRY. The SAVRY measures risk of violence in adolescents. It does so within three domains (historical, social/contextual, and individual) through 24 risk factors, which are rated as low (not present), moderate (present, but rare or mild), or high (obvious and persistent). An additional 6 items are included to capture the presence of protective factors. Table 1 presents the breakdown of the tool's items. For analysis, the level of each risk factor was coded as 0, 1, or 2, (*low, moderate, or high*) while protective factors were coded on presence only (0 = *not present*, 1 = *present*). After the items are rated, the administrator uses structured professional judgment to determine the summary risk rating, or, overall risk of violence: low, moderate, or high. Although the SAVRY does not use cut-off scores, a total numerical score can be calculated for research purposes by summing the 24 risk factors. The SAVRY manual indicates an interrater reliability (IRR) value of .83 for the total score and .72 for the summary risk rating, indicating good and acceptable reliability, respectively (Borum et al., 2009).

Recidivism data. Recidivism was defined in two forms: a new petition following the SAVRY administration, and a new adjudication following the SAVRY administration. Recidivism data were obtained through hired research assistants on site at the probation offices, and included juvenile and adult records as some youth aged out of the juvenile system during the follow-up period. This data was then categorized into offense types. The SAVRY manual

provides descriptions on the criteria required to determine violent offenses (Borum et al., 2009). Nonviolent/violations accounted for any offenses that could not be considered violent, such as drug offenses or probation violations. Juveniles were tracked for an average period of 18 months post-adjudication by the researchers. This study did not consider time spent in any placements or detention facilities, so that time to reoffense did not account for periods when the juvenile was unable to reoffend.

Procedure

POs trained in the SAVRY administered the tool to youths during intake. They assigned a SRR for each youth upon consideration of all risk and protective factors. A total numerical score was calculated by summing the numeric equivalent ratings of each risk factor, but not protective factors. Accuracy and consistency were assessed through IRR using independent ratings of 10 POs and a trained research assistant, whom observed the intakes and was exposed to the same file information. From the 28 cases rated, ICC values were calculated for the SRR (.75) and for the total numerical score (.94), indicating a good and excellent degree of agreement, respectively.

Statistical Analyses

Receiver Operating Characteristics (ROC) Analyses. This method of analyses will be employed to measure the accuracy of the SAVRY total score in predicting future reoffending of all adjudicated youth in the sample, as well as across race. This type of analysis is generally used to examine the ability of an instrument to predict a dichotomous outcome. It is often used and preferred for prediction of risk for violence (Swets, Dawes, & Monohan, 2000), as it remains constant regardless of base rates or selection ratios (Mossman & Somoza, 1991), which is a frequent problem in risk assessment analyses. ROC analysis produces a curved graph that plots

sensitivity (the probability of accurate prediction of recidivists; true positive outcomes) against specificity (the proportion predicted as recidivists that did not recidivate; false positive outcomes).

Chi-square Analyses. The relationship between the SRR and all forms of recidivism will be examined through chi-square analysis, in consideration of the overall sample as well as by race. Results are based on a crosstabulation table, where it compares observed occurrences of a particular event (in this case, recidivism) with the values that would be expected should there be no significant relationship between the variables (recidivism and the SRR).

Hierarchical Cox Regressions and Survival Analyses. These analyses describe time to recidivism and offer insight into any racial differences in predictive validity as presented in ROC analyses. They are able to control for any differences in follow-up period lengths. The Kaplan-Meier survivor (one who does not reoffend) function is a nonparametric test that estimates the likelihood that a juvenile will *not* reoffend by a specified time interval. A cox regression is a semiparametric test that accounts for time to occurrence of a particular event (in this case, rearrest) in its presentation of the relationship between the predictor variables and the event. This analysis calculates a hazard ratio; the likelihood of the event occurring in any given time interval.

Results

Descriptive Statistics

Risk classification. Within the overall sample, the SAVRY total score ranged from 0 to 38, with a mean score of 13.29 ($SD = 8.05$). From the total sample, 41.2% ($n = 110$) were rated *Low* risk, 46.4% ($n = 124$) *Moderate* risk, and 12.4% ($n = 33$) *High* risk. Table 2 provides a comparison of SAVRY total scores and SRR by race. An independent samples t-test revealed no significant differences between Whites ($M = 13.52$, $SD = 8.69$) and African Americans ($M =$

13.23, $SD = 7.89$), $t(265) = .24$, $p = \text{n.s.}$ on the SAVRY total score. The SRR also failed to show any significance following chi-square analyses, between both races; $\chi^2(2, n = 267) = .73$, $p = \text{n.s.}$

Base rates of recidivism. As captured by petitions, roughly 46% ($n = 123$) of the overall sample were charged with a general reoffense, whereas 16.5% ($n = 44$) of participants were charged with a violent reoffense. In terms of adjudications, nearly 35% ($n = 93$) of the overall sample committed a general form of recidivism. Only 10.1% ($n = 27$) of juveniles were adjudicated for a violent reoffense. The Louisiana Office of Juvenile Justice (OJJ) reports recidivism rates of 13.6% for one year and 22.1% by two years after initial adjudication for juveniles under supervision between 2008 and 2010. Given that 35% of the current sample recidivated (in terms of adjudications) over an average period of 18 months, this suggests that the base rates of recidivism for this sample are higher than those of the general juvenile population in Louisiana. Descriptive statistics for petitions and adjudications of general and violent recidivism by SRR are presented in Table 3, separated by overall sample and race.

Predictive Validity Analyses of SAVRY total score and SRR

Receiver operating characteristics (ROC). ROC analyses were performed to investigate the predictive validity of the SAVRY total score. ROC curves are used to describe a tool's ability to predict an occurrence of an event with a dichotomous outcome; in this case the event is rearrest. Further, the AUC is the likelihood that a juvenile who recidivated will score higher on the measure than a juvenile who did not recidivate. Regarding petitions, AUC values for the SAVRY total score in the overall sample were significant; .62 (95%, CI = .56 to .69) for general recidivism and .68 (95%, CI = .60 to .76) for violent recidivism. AUC values were also significant within the context of overall sample adjudications; .64 (95%, CI = .58 to .71) for

general recidivism and .69 (95%, CI = .59 to .79) for violent recidivism. The SAVRY total score was moderately predictive for White juveniles *only* when looking at general recidivism petitions; AUC .67, 95% CI .52-.81. The SAVRY total score was less predictive than the same form of recidivism when examining the African American participants; AUC .61, 95% .54-.69. Table 4 displays AUC values and confidence intervals for recidivism for African American juveniles, all of which show the SAVRY total score significantly predicts general and violent recidivism for these youth.

Chi-square analyses. In the overall sample, the SRR failed to significantly predict recidivism for general recidivism petitions. However, it significantly predicted recidivism for all other contexts: general recidivism adjudications; $\chi^2(2, n = 267) = 8.54, p = .01$, violent recidivism petitions; $\chi^2(2, n = 267) = 8.32, p = .02$, and violent recidivism adjudications; $\chi^2(2, n = 267) = 8.76, p = .01$. When focusing on the African American juveniles, a similar pattern appeared that was observed when examining the overall sample. The SRR failed to show an association with recidivism in the context of general recidivism petitions. The SRR was a significant predictor for general; $\chi^2(2, n = 213) = 7.53, p = .02$ and violent recidivism adjudications; $\chi^2(2, 213) = 5.91, p = .05$. It approached significance for violent recidivism petitions; $\chi^2(2, n = 213) = 5.72, p = .057$. For White juveniles, the SRR did not show a significant relationship to general or violent recidivism as captured by either petitions or adjudications.

Time to Reoffense

Hierarchical Cox regressions. In order to examine the association between SAVRY scores (total and SRR) and time to first reoffense, this study used hierarchical Cox regressions. Time at risk was calculated for general recidivism and violent recidivism separately, determined

by the days between the first SAVRY administration and the first petition or adjudication for that offense type. For the juveniles who did not recidivate, time at risk was determined in accordance with the final follow-up date. A series of hierarchical Cox regressions were then performed, with the SAVRY total numeric score entered on the first block, followed by the SRR on the second block. This order allows examination of the contribution of the SRR. Within the context of petitions, the total score was significantly related to time to general recidivism ($\beta=.05$, $SE=.01$, $\text{Exp}(B)=1.05$, $p<.001$) and violent recidivism ($\beta=.07$, $SE=.02$, $\text{Exp}(B)=1.08$, $p<.001$), but the SRR did not contribute to either equation. In other words, increases in the SAVRY total score are associated with faster times to reoffense. The same pattern is observed for adjudications of general ($\beta=.06$, $SE=.01$, $\text{Exp}(B)=1.06$, $p<.001$) and violent recidivism ($\beta=.08$, $SE=.02$, $\text{Exp}(B)=1.08$, $p<.001$). Regarding violent adjudications specifically, the addition of the SRR in the second block, in fact, reduced the significance of the SAVRY total score.

Figures 1 and 2 display the survival plots from the Kaplan-Meier survival function for general recidivism in the overall sample. Statistically significant differences were observed between the SRR in survival time for general recidivism (petitions and adjudications), but not for violent recidivism (petitions and adjudications). As would be naturally expected, general reoffending rates for high risk juveniles are shown to be higher than for moderate risk juveniles, and moderate risk juveniles generally recidivated at a higher rate than the low risk juveniles.

Moderated hierarchical Cox regressions. In order to examine the moderating effect race might have on the predictive validity of the SAVRY, moderated hierarchical Cox regressions were performed. First, z scores were calculated to standardize the SAVRY total score. Following, an interaction term was calculated by multiplying the standardized SAVRY total scores with race. This represents the interaction between the SAVRY total scores and race. The

resulting Cox regression was structured as such: on block one, SAVRY total score (nonstandardized) and race were entered. The SRR was entered into the second block, and finally, the interaction term was entered into the third block. This analysis was performed separately for petition recidivisms and adjudication recidivisms. Race did not prove to be a moderator within any context of recidivism, petitions or adjudications.

Discussion

The current study utilized a sample of White and African American male juveniles from probation offices in Louisiana in order to examine the predictive validity of the SAVRY within the context of race. The research also explored racial differences in time to reoffense. This study contains two notable strengths over previous research: trained field raters were used to obtain SAVRY ratings, and participants were obtained from the community, as opposed to detained or institutionalized juvenile offenders.

In terms of the hypotheses proposed, none appeared to be fully supported. Hypothesis one was not supported, as significant differences were not observed between White and African American participants on SAVRY total score or SRR. This indicates that neither race is considered more dangerous than the other, in terms of what their SAVRY scores report. Proportions of offenders are similar in terms of risk level, and therefore we can expect them to behave similarly. Therefore, given the equivalence in scores and distribution of scores, one would not expect differences in the SAVRY's predictive ability across these races.

Hypothesis two was supported such that ROC analyses did show the SAVRY total score to be predictive of recidivism. However, it failed to predict for White juveniles in all but one form of recidivism (general petitions). It is possible the small number of White participants in the study ($n = 54$) likely had an impact on the resulting predictive strength SAVRY total score (and

SRR), as previous literature supports use of SAVRY scores for predicting violence and recidivism (Gammelgard et al., 2008; Meyers & Schmidt, 2008; Vincent et al., 2011).

The third hypothesis was also only partially supported; chi-square analyses revealed the SRR to be significantly related to recidivism only for African American offenders. Again, the low number of White participants tempers the interpretation, as a few cell expectancy requirements were not met in analyses. Extant literature shows support for the use of SRR in predicting violence reoffending (Gammelgard et al., 2008; Meyers & Schmidt, 2008; Vincent et al., 2011). It is important to note, also, that previous research has supported the use of the SRR assigned by trained research assistants and forensic clinicians (Douglas, Yeoman, & Boer, 2005; Guy, 2008), perhaps the POs could have used more training and practice at using SPJ methods in their SRR assignments.

The final hypothesis was not supported, given that the SAVRY was more effective at predicting recidivism for African Americans than for Whites. The piece regarding the White juveniles is to be taken lightly and with trepidation, as, again, the confidence of the results and interpretations are lowered in consideration of the low proportion of White offenders to their African American counterparts. The SAVRY has been previously validated in numerous studies with White participants (e.g., Meyers & Schmidt, 2008; Singh et al., 2010; Vincent et al., 2006), and thus it cannot be suggested that the current study's results accurately portray the predictive strength of the tool for White offenders.

The AUC values obtained in this research are comparable to those reported in previous studies investigating the predictive validity of the SAVRY total score using ROC analyses (Gammelgard et al., 2008; Meyers & Schmidt, 2008; Singh et al., 2010). Looking at the current study's AUC values, a clear pattern is observed where, in the overall sample, violent recidivism

is more strongly predicted than general recidivism (for both petitions and adjudications). This finding was theoretically expected, given that the SAVRY was developed to assess risk of violence, specifically. For African American juveniles, AUC values were equal when examining petitions and adjudications of violent recidivism. In terms of the chi-square analyses, general recidivism petitions were not predicted in any model. This may be a result of the inclusiveness of the variable itself, as petitions for violent, nonviolent, and violations recidivism are included. Given that the SAVRY was empirically designed to assess risk for violence, including so many possible outcomes within one form of recidivism could have weakened the statistical power of the SRR.

Chi-square analyses revealed significant differences for violent recidivism petitions depending on race of the subjects. African American juveniles were significantly more likely than White juveniles to commit violent recidivism, as defined by petitions. Given this finding, it is logical to then expect that the SAVRY would predict violent recidivism more strongly for African Americans than Whites, which is what results generally showed in the current research. The significance, however, disappeared when examining adjudications of violent recidivism. The possibility of racial bias in petitions can be considered, as arrest records are more likely to show inflated rates of offending for racial minority groups. However it appears that through the judicial process and by the time the charge is disposed of, race becomes less of a factor.

The Kaplan-Meier survival plots indicated that the SRR and time to violent recidivism (petitions or adjudications) were not significantly related. Significance was only observed for general recidivism (petitions and adjudications). Only 10% (adjudications) to 16.5% (petitions) of the sample recidivated violently, and it's possible that significant differences were not observed in light of such a small percentage of the total sample violently recidivating. In

contrast, general recidivism accounts for 34.8% (adjudications) to 46.1% (petitions) of recidivism in the overall sample.

Hierarchical Cox regressions revealed the SAVRY total score to be a significant predictor of time to all contexts and forms of recidivism. As was expected, a stronger relationship was observed between the total score and both contexts of violent recidivism, than for general recidivism. However contrary to expectations, the SRR did not contribute to the equations, suggesting that the SPJ of the probation officer did not add any predictive value over what the SAVRY total score already provided. Again, it's possible that with additional training or practice in SPJ methods in conjunction with SAVRY administration, the SRR may prove to be more valuable than it appears in the current results.

Finally, race did not show to be a significant moderator between SAVRY scores and time to reoffense for any type or context of recidivism. This suggests that the SAVRY scores (total and SRR) are able to accurately predict time to recidivism equally well across races. This finding is similar to the results obtained when Vincent and colleagues (2006) examined time to reoffense for detained African Americans, Whites, and Latinos, in Connecticut.

Limitations and Future Directions

As previously mentioned, this research identifies a limitation in the small number of White participants in the current study threatened some of the findings and interpretations, and is identified as a significant limitation. For instance, chi-square analyses on Whites only were unreliable, as cell count requirements did not meet the minimum expectancy in some cases. Furthermore, the results of this study cannot offer any information regarding female offenders, as female participants were not included due to their low number. Given that literature does not currently exist examining the predictive validity of the SAVRY for community based female

juvenile offenders of diverse racial backgrounds, future research would be wise to consider this population.

Additionally, literature has previously identified significant differences in raters of risk assessment tools, based on juvenile race (Chapman et al., 2006). Chapman and colleagues, for example, found that African American juvenile detainees were more likely to be rated on the SAVRY by an African American rater, and by a male rater. They also observed that African American raters were more likely to assign detainees a moderate risk rating rather than a high one. Analyses of the PO's and juvenile's race in terms of the resulting SAVRY total score and SRR may prove to be interesting in the event of any possible biases in the assessment.

Conclusion

The results of the current research extend the existing body of information concerning the predictive validity of the SAVRY (as administered in the field) to African American juvenile offenders within a community sample. Overall, the SAVRY appears to be a valid risk assessment tool that can be appropriately used with African American juvenile offenders, in terms of both the total numeric score as well as the SRR, in predicting general and violent recidivism, as defined by either petitions or adjudications. It is notable that all but one of the analyses examining the SAVRY's predictive ability for African American juveniles showed significant results. These results tentatively support the use of the SAVRY as a culturally invariant risk assessment tool. Although the current study's results did not, overall, support the use of the SAVRY in predicting recidivism for Whites, this finding is considered unreliable in consideration of the host of existing research using large samples of White juveniles, which show significant relationships between the SAVRY and violent outcomes (Borum et al., 2006; Welsh et al., 2008).

Confidence, however, in identifying the SAVRY as a culturally invariant tool cannot come without *much* more additional research that verifies the results and interpretations of the current research for African Americans. This study is the first of its kind examining diverse community based offenders assessed by field raters, and thus provides the only evidence for the conclusions made. The context of the SAVRY's use cannot be ignored when making such interpretations, as the tool is used in a variety of decision points that have implications on the way a juvenile is handled within the judicial system. Therefore it is imperative to have a high degree of confidence in such conclusions before safely and appropriately using such a tool.

References

- Bechtel, K., Lowenkamp, C. T., & Latessa, E. (2007). Assessing the risk of re-offending for juvenile offenders using the youth level of service/case management inventory. *Journal of Offender Rehabilitation, 45*(3-4), 85-108.
- Borum, R. (2000). Assessing violence risk among youth. *Journal of Clinical Psychology, 56*(10), 1263-1288.
- Borum, R., Bartel, P., & Forth, A. (2006). *Structured Assessment of Violence Risk in Youth (SAVRY)*. Lutz, FL: Psychological Assessment Resources.
- Borum, R., Lodewijks, H., Bartel, P., & Forth, A. (2009). Structured Assessment of Violence Risk in Youth (SAVRY). In K. Douglas & R. Otto (Eds.). *Handbook of violence risk assessment* (pp. 63-80). New York, NY: Routledge.
- Catchpole, R. E. H., Gretton, H. M. (2003). The predictive validity of risk assessment with violent young offenders: A 1-year examination of criminal outcome. *Criminal Justice and Behavior, 30*(6), 688-708.
- Chapman, J. F., Desai, R. A., Falzer, P. R., & Borum, R. (2006). Violence risk and race in a sample of youth in juvenile detention. The potential to reduce disproportionate minority confinement. *Youth Violence and Juvenile Justice, 4*(2), 170-184. doi: 10.1177/1541204006286316
- Douglas, K. S., & Webster, C. D. (1999). Predicting violence in mentally and personality disordered individuals. In R. Roesch, S. D. Hart, & J. R. P. Ogloff (Eds.), *Law and Psychology: The state of the discipline* (pp. 176-239). New York: Plenum.

- Douglas, K. S., Yeoman, M., & Boer, D. P. (2005). Comparative validity analysis of multiple measures of violence risk in a sample of criminal offenders. *Criminal Justice and Behavior, 32*, 479-510.
- Flores, A. W., Travis, L. F., & Latessa, E. J. (2003). *Case classification for juvenile corrections: An assessment of the Youth Level of Service/Case Management Inventory (YLS/CMI)*. Cincinnati, OH: Centre for Criminal Justice Research, University of Cincinnati.
- Forth, A. E., Kosson, D. S., & Hare, R. D. (2003). *The Psychopathy Checklist: Youth Version*. Toronto, Ontario, Canada: Multi-Health Systems.
- Gammelgard, M., Koivisto, A. M., Eronen, M. & Kaltiala-Heino, R. (2008). The predictive validity of the structured assessment of violence risk in youth (SAVRY) among institutionalized adolescents. *The Journal of Forensic Psychiatry & Psychology, 19*(3), 352-370.
- Griffin, P. & Bozynski, M. (2003). National overviews: State juvenile justice profiles. Retrieved November 5, 2003, from <http://www.ncjj.org/stateprofiles/>
- Grisso, T., Vincent, G. M., & Seagrave, D. (2005). *Mental health screening and assessment in juvenile justice*. New York, NY: Guilford Press.
- Guy, L. S. (2008). *Performance indicators of the structured professional judgment approach for assessing risk for violence to others: A meta-analytic survey* (Unpublished doctoral dissertations). Simon Fraser University, Burnaby, BC.
- Hoge, R. D., & Andrews, D. A. (1996). *The youth level of service/case management inventory: Description and evaluation*. Paper presented at the Annual Conference of the American Psychological Association, Toronto, Canada.

- Jung, S., & Rawana, E. P. (1999), Risk and need assessment of juvenile offenders. *Criminal Justice and Behavior*, 26, 69-89.
- Lodewijks, H. P. B., Doreleijers, T. A. H., de Ruiter, C., & Borum, R. (2008). Predictive validity of the structured assessment of violence risk in youth (SAVRY) during residential treatment. *International Journal of Law and Psychiatry*, 31, 263-271.
- Meyers, J. R., & Schmidt, F. (2008). Predictive validity of the structured assessment for violence risk in youth (SAVRY) with juvenile offenders. *Criminal Justice and Behavior*, 35(3), 344-355.
- Mossman, D., & Somoza, E. (1991). ROC curves, test accuracy, and the description of diagnostic tests. *Journal of Neuropsychiatry and Clinical Neurosciences*, 3, 330-333.
- Puzzanchera, C., Adams, B., & Hockenberry, S. (2012). *Juvenile court statistics 2009*. Pittsburgh, PA: National Center for Juvenile Justice.
- Rodriguez, N. (2010). The cumulative effect of race and ethnicity in juvenile court outcomes and why preadjudication detention matters. *Journal of Research in Crime and Delinquency*, 47(3), 391-413.
- Schmidt, F., Hoge, R. D., & Gomes, L. (2005). Reliability and validity of the youth level of service/case management inventory. *Criminal Justice and Behavior*, 32(3), 329-344.
- Schmidt, F., McKinnon, L., Chattha, H. K., & Brownlee, K. (2006). Concurrent and predictive validity of the psychopath checklist: Youth version across gender and ethnicity. *Psychological Assessment*, 18(4), 393-401.
- Schwalbe, C. S. (2007). Risk assessment for juvenile justice: A meta-analysis. *Law and Human Behavior*, 31(5), 449-462.

- Schwalbe, C. S., Fraser, M. W., Day, S. H., & Cooley, V. (2006). Classifying juvenile offenders according to risk of recidivism: Predictive validity, race/ethnicity, and gender. *Criminal Justice and Behavior, 33*, 305-324.
- Schwalbe, C. S., Fraser, M. W., Day, S. H. (2007). Predictive validity of the Joint Risk Matrix with juvenile offenders. A focus on gender and race/ethnicity. *Criminal Justice and Behavior, 34*(3), 348-361. doi: 10.1177/0093854806292244
- Singh, J. P., Grann, M., & Fazel, S. (2010). 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.
- Swets, J. A., Dawes, R. M., & Monohan, J. (2000). Psychological science can improve diagnostic decisions. *Psychological Science in the Public Interest: A Journal of the American Psychological Society, 1*, 1-26.
- Thompson, A. P., & Putnins, A. L. (2003). Risk-need assessment inventories for juvenile offenders in Australia. *Psychiatry, Psychology, and Law, 10*(2), 324-333.
- Towberman, D. B. (1992). A national survey of juvenile risk assessment. *Family & Juvenile Court Journal, 43*, 61-67.
- Vincent, G. M., Chapman, J., Cook, N. E. (2011). Risk-needs assessment in juvenile justice. Predictive validity of the SAVRY, racial differences, and the contribution of needs factors. *Criminal Justice and Behavior, 38*(1), 42-62. doi: 10.1177/0093854810386000
- Webster, C. D., Douglas, K. S., Eaves, S. D., & Hart, S. D. (1997). *HCR-20: Assessing risk for violence (Version 2)*. Vancouver, Canada: Mental Health Law and Policy Institute, Simon Fraser University.

Welsh, J. L., Schmidt, F., McKinnon, L., Chattha, H. K., & Meyers, J. R. (2008). A comparative study of adolescent risk assessment instruments: Predictive and incremental validity.

Assessment, 15, 104-115.

Appendix

Table 1

Structured Assessment of Violence Risk in Youth: Risk and Protective Factors

Historical Risk Factors

- History of violence
- History of nonviolent offending
- Early initiation of violence
- Past supervision or intervention failures
- History of self-harm or suicide attempts
- Exposure to violence in the home
- Childhood history of maltreatment
- Parental or caregiver criminality
- Early caregiver disruptions
- Poor school achievement

Social/Contextual Risk Factors

- Peer delinquency
- Peer rejection
- Stress and poor coping
- Poor parental management
- Lack of personal or social support
- Community disorganization

Individual Risk Factors

- Negative attitudes
- Risk taking or impulsivity
- Substance use difficulties
- Anger management problems
- Low empathy or remorse
- Attention deficit hyperactivity disorder
- Poor compliance
- Low interest or commitment to school

Protective Factors

- Prosocial involvement
- Strong social support
- Strong attachments and bonds
- Positive attitude toward intervention and authority
- Strong commitment to school
- Resilient personality traits

Table 2

Descriptive Statistics of the SAVRY Total Score and Summary Risk Rating by Race

	Overall (<i>N</i> = 267)	White (<i>n</i> = 54)	African American (<i>n</i> = 213)
SAVRY total (risk items) <i>M</i> (<i>SD</i>)	13.29 (8.05)	13.52 (8.69)	13.23 (7.89)
Summary Risk Rating <i>n</i> (%)			
Low	110 (41.2)	25 (46.3)	85 (39.9)
Moderate	124 (46.4)	23 (42.6)	101 (47.4)
High	33 (12.4)	6 (11.1)	27 (12.7)

Note. SAVRY = Structured Assessment of Violence Risk in Youth (Borum, Bartel, & Forth, 2006).

Table 3

Descriptive Statistics for General Recidivism and Violent Recidivism by SRR and Race

Recidivism <i>n</i> (%)	Overall (<i>N</i> = 267)	White (<i>n</i> = 54)	African American (<i>n</i> = 213)
General recidivism			
Petitions	123 (46.1)	24 (44.4)	99 (46.5)
Low	45 (40.9)	8 (32.0)	37 (43.5)
Moderate	57 (46.0)	12 (52.2)	45 (44.6)
High	21 (63.6)	4 (66.7)	17 (63.0)
Adjudications	93 (34.8)	22 (40.7)	71 (33.3)
Low	30 (27.3)	7 (28.0)	23 (27.1)
Moderate	45 (36.3)	12 (52.2)	33 (32.7)
High	18 (54.5)	3 (50.0)	15 (55.6)
Violent recidivism			
Petitions	44 (16.5)	4 (7.4)	40 (18.8)
Low	11 (10.0)	0 (0.0)	11 (12.9)
Moderate	23 (18.5)	3 (13.0)	20 (19.8)
High	10 (30.3)	1 (16.7)	9 (33.3)
Adjudications	27 (10.1)	4 (7.4)	23 (10.8)
Low	5 (4.5)	0 (0.0)	5 (5.9)
Moderate	15 (12.1)	3 (13.0)	12 (11.9)
High	7 (21.2)	1 (16.7)	6 (22.2)

Note. Percentages within SRR categories reference percentage of juveniles within that risk category whom recidivated.

Table 4

Area Under the Curve (AUC) for General and Violent Recidivism by Race

Recidivism	AUC		SE		95% CI	
	Whites	African Americans	Whites	African Americans	Whites	African Americans
General						
Petitions	.67	.61**	.07	.04	.52-.81	.54-.69
Adjudications	.64	.64*	.08	.04	.50-.79	.57-.72
Violent						
Petitions	.71	.68*	.09	.05	.53-.89	.59-.77
Adjudications	.71	.68**	.09	.06	.53-.89	.57-.80

* $p < .001$. ** $p < .01$.

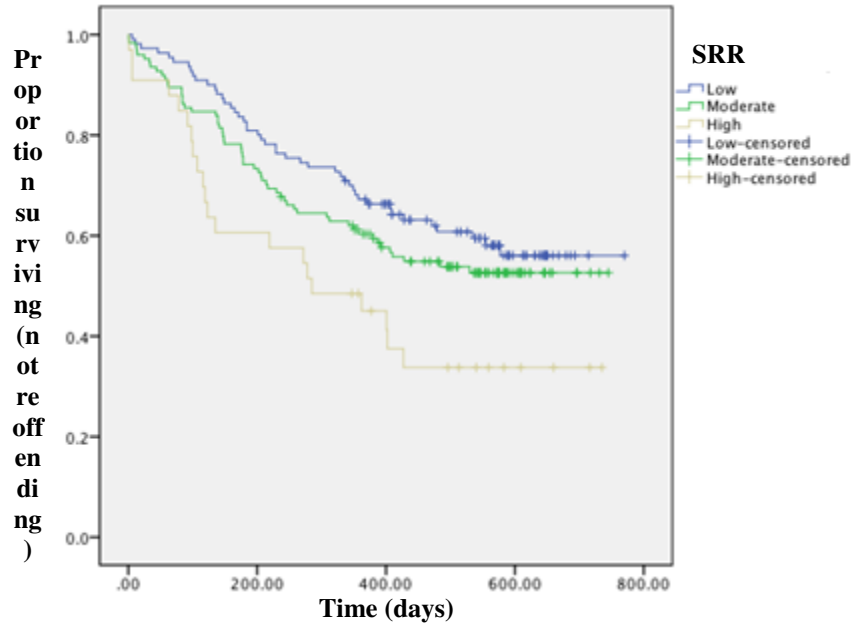


Figure 1. Kaplan-Meier survival curve for General Recidivism petitions in overall sample, by SRR.

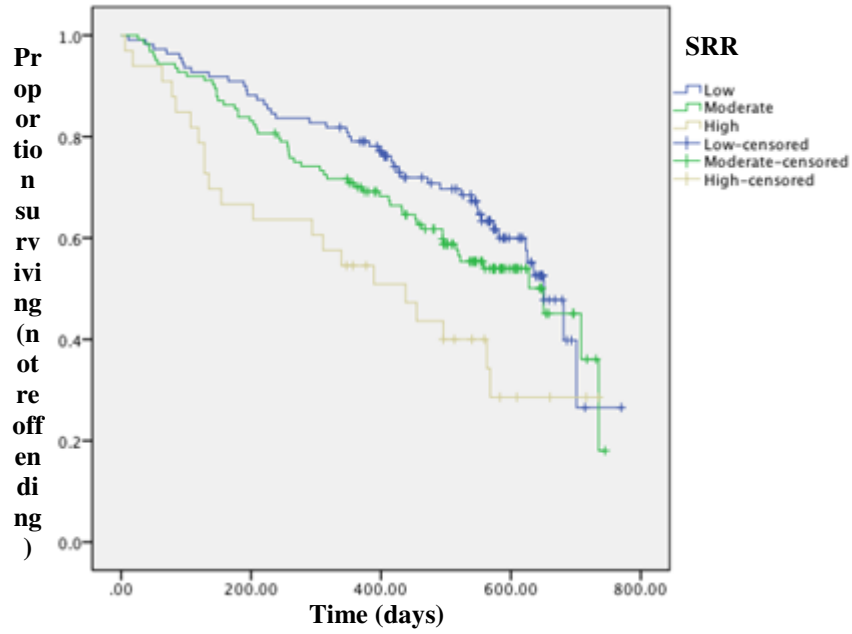


Figure 2. Kaplan-Meier survival plots for General Recidivism adjudications in overall sample, by SRR.