Assessing Protective Factors for Adolescent Offending:
A Conceptually-Informed Examination of the SAVRY and YLS/CMI

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Assessment

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Abstract

Although the Structured Assessment of Violence Risk in Youth (SAVRY) and the Youth Level of Service/Case Management Inventory (YLS/CMI) are among the most widely used adolescent risk assessment tools, they conceptualize and measure strengths differently. As such, in this study, we compared the predictive validity of SAVRY Protective Total and YLS/CMI Strength Total, and tested conceptual models of how these measures operate (i.e., risk vs. protective effects, direct vs. buffering effects, causal models). Research assistants conducted 624 risk assessments with 156 youth on probation. They rated protective factors at baseline, and again at 3-, 6-, 9-, and 12-month follow-up periods. The SAVRY Protective Total and YLS/CMI Strength Total inversely predicted any charges in the subsequent two years (area under the curve scores [AUCs] = .61 and .60, respectively, $p < .05$). Furthermore, when adolescents' protective total scores increased, their self-reported violence decreased, thus providing evidence that these factors might play a causally-relevant role in reducing violence. However, protective factors did not provide incremental validity over risk factors. In addition, because these measures are brief and use a dichotomous rating system, they primarily captured *deficits* in protective factors (i.e., low scores). This suggests a need for more comprehensive measures.

Keywords: protective factors, risk assessment, dynamic factors, adolescent, violence, offending

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Violence risk assessments are one of the most common assessments conducted by professionals in forensic and correctional settings (Singh et al., 2014; Viljoen, McLachlan, & Vincent, 2010). These assessments are used to plan interventions and inform legal decisions, such as decisions about whether to incarcerate an adolescent. Although risk assessments generally focus on identifying risk factors, or factors that heighten risk for reoffending (e.g., anger management difficulties), many researchers and professionals also consider it important to identify protective factors (Viljoen et al., 2010).

Definitions of protective factors vary somewhat. However, risk assessment researchers typically use the term protective factors broadly to mean strengths or positive attributes that reduce the likelihood of violence or offending (see Borum, Bartel, & Forth, 2006). This is the definition that we adopted in the current study. In contrast, some researchers use the term protective factors more narrowly to refer to factors that *buffer* risk among individuals who pose an elevated risk for violence or offending (i.e., an interaction effect; Stouthamer-Loeber, Loeber, Wei, Farrington, & Wikström, 2002; Rutter, 1987); they use alternative terms, such as promotive factors, to refer to factors that directly reduce reoffending (i.e., a main effect).

Even though there is no single agreed-upon definition of protective factors, researchers and professionals have identified numerous reasons why it may be important to assess protective factors. Many researchers believe that assessing protective factors may improve the accuracy of risk assessments, provide a more balanced perspective, enhance offenders' motivation to change, and guide intervention-planning (de Ruiter & Nicholls, 2011; de Vries Robbé & Willis, 2017). Furthermore, professionals consider protective factors to be even more important for *adolescent* offenders than adults (Viljoen et al., 2010). Indeed, in our view, professionals appear to consider protective factors to be a means by which to soften the conclusions of risk assessments, and mitigate against stigma that could be caused by judging an adolescent as "high risk."

Measurement of Protective Factors in Adolescent Risk Assessment Tools

As a result of the perceived benefits of assessing protective factors, several adolescent risk assessment tools include protective factors. Currently, the Structured Assessment of Violence Risk in Youth (SAVRY; Borum et al., 2006) is the most widely used and researched measure of protective factors in adolescent offenders (Dickens & O'Shea, 2017). The SAVRY includes six protective factors that are rated as present or absent (e.g., strong attachments and bonds, strong school commitment).

A number of studies have investigated the predictive validity of the SAVRY protective factors. Many of these studies have indicated that SAVRY protective factors are associated with reduced likelihood of reoffending (i.e., Gammelgård, Koivisto, Eronen, & Kaltiala-Heino, 2015; Guy, 2008; Lodewijks, de Ruiter, & Doreleijers, 2010; McGowan, Horn, & Mellott, 2011; Rennie & Dolan, 2010; Ortega-Campos, García-García, & Zaldívar-Basurto, 2017; Schmidt, Campbell, & Houlding, 2011; Shepherd, Luebbers, Ogloff, Fullam, & Dolan, 2014; Vincent, Guy, Gershenson, & McCabe, 2012). However, other studies have failed to find significant

associations (i.e., Hilterman, Nicholls, & van Nieuwenhuizen, 2014; Klein, Rettenberg, Yoon, Köhler, & Briken, 2015; Penney, Moretti, & Lee, 2010; Perrault, Vincent, & Guy, 2017; Viljoen et al., 2008), or have yielded mixed results (i.e., Chu, Goh, & Chong, 2016; Dolan & Rennie, 2008; Vincent, Chapman, & Cook, 2011; Zhou, Witt, Cao, Chen, & Wang, 2017). Recently, a systematic review aggregated these findings (Dickens & O'Shea, 2017). Although adolescents with higher scores on SAVRY protective factors were somewhat less likely to engage in offending or violence than other adolescents (Hedge's g effect size = 0.68; 95% CI = -1.53 to 0.18; k = 14 studies), this value did not reach statistical significance at an aggregate level (p = .124). Furthermore, the authors concluded that there was no evidence that measures of protective factors improved predictions of adolescent reoffending over risk factors.

Besides the SAVRY, another widely used adolescent risk assessment tool which includes strengths is the Youth Level of Service/Case Management Inventory (YLS/CMI; Hoge & Andrew, 2002). In contrast to the SAVRY, the YLS/CMI is designed to assess general offending, rather than violence specifically. In addition, unlike the SAVRY, the YLS/CMI does not have a separate stand-alone section on protective factors. Instead, assessors rate the extent to which an adolescent has needs and/or strengths in seven domains (e.g., Family Circumstances/Parenting, Education/Employment). In other words, each domain is rated for both risks and strengths. Although the YLS/CMI has a similar number of strengths as the SAVRY, the YLS/CMI is not commonly thought of as a measure of strengths. Also, some authors have criticized the risk-need-responsivity model (Bonta & Andrews, 2017), upon which the YLS/CMI is based, as being primarily a deficit-based rather than strength-based model (Ward, Yates, & Willis, 2012).

Perhaps as a result of this perception, research on the YLS/CMI strength ratings is limited. Thus far, two published studies (Chu et al., 2015; Shepherd, Strand, Viljoen, & Daffern, 2018) and an unpublished dissertation (Royer-Gagnier, 2013) have examined associations between YLS/CMI strengths ratings and reoffending. In these studies, YLS/CMI strength scores predicted reduced likelihood of general reoffending (Chu et al., 2015; Royer-Gagnier, 2013; Shepherd et al., 2018). However, results were mixed as to whether strengths remained predictive after controlling for risk factors (Royer-Gagnier, 2013; Shepherd et al., 2018). In two additional studies, researchers created their own measure of strengths based on the Australian adaptation of the YLS/CMI (Thompson & Pope, 2005; Upperton & Thompson, 2007). The findings were mixed. However, these results may have limited generalizability to the actual strength measurement approach used in the YLS/CMI.

In sum, the vast majority of studies on the assessment of protective factors in adolescent offenders have focused on the SAVRY, with little attention to other measurement approaches (Dickens & O'Shea, 2017). Furthermore, despite the early enthusiasm for including protective factors in risk assessment tools, protective factors have not consistently translated into improved assessments, thus leading to growing questions about whether assessing protective factors adds value (Dickens & O'Shea, 2017; O'Shea & Dickens, 2016).

Gaps in Research: The Need for Conceptually-Informed Research

To help make sense of the variable findings in this area, there is a need for future research

that addresses methodological limitations of prior work. For instance, although the SAVRY and YLS/CMI protective factors are meant to be rated based on a combination of interviews and file review, in many studies, research assistants (RAs) have coded tools from archival file information alone (e.g., Schmidt et al., 2011). In addition, researchers have typically measured offending based on official records (for an exception, see Hilterman et al., 2014). However, official records fail to detect a large proportion of offenses (Farrington, Jolliffe, Loeber, & Homish, 2007). This is because many crimes are not reported to the police and adolescents are often given warnings rather than being charged (Puzzanchera & Hockenberry, 2013). For instance, in Canada, only 48% of adolescents accused of a crime are charged (Allen & Superle, 2016).

However, besides simply more research, there is a need to tackle some of the conceptual issues that undermine and threaten the measurement of protective factors (Fortune & Ward, 2017; Ward, 2017). Indeed, risk assessment researchers have not yet developed clear conceptualizations of protective factors, such as how they are distinct from risk factors. This is problematic, as it is difficult to measure protective factors without a clear understanding of what these factors are. As such, we examined several conceptual issues in this study.

Correspondence Between the SAVRY and the YLS/CMI. First, although the SAVRY and YLS/CMI are among the most widely used adolescent risk assessment tools (see Viljoen et al., 2010), they operationalize and measure protective factors differently. Both tools have a similar number of protective factors (i.e., six or seven items). However, whereas the SAVRY has a separate, stand-alone section for protective factors with discrete item ratings, on the YLS/CMI, assessors can identity if certain need domains are, more globally, overall areas of strength. Also, while the SAVRY authors explicitly define protective factors as factors that reduce reoffending (Borum et al., 2006), the YLS/CMI authors conceptualize strengths as factors which are primarily relevant to treatment-planning rather than prediction (Hoge & Andrews, 2002). Currently, it is unclear how these differences between the SAVRY and the YLS/CMI impact the measurement of protective factors. To our knowledge, no prior studies have compared the SAVRY protective factors and YLS/CMI strengths.

Distinctiveness of Risk and Protective Factors. Second, it is unclear if the protective factors on these measures are distinct from risk factors and add new information. As some authors have observed, protective factors often appear to be the positive pole of risk factors, thus leading to questions about whether protective factors hold additional value (Monahan & Skeem, 2016). For instance, although some authors might consider school commitment to be a protective factor (i.e., strong school commitment), others consider it to be a risk factor (i.e., low school commitment).

The distinction between risk and protective factors is undoubtedly a difficult question, and one which is not likely to be easily resolved. However, to help disentangle these factors, some leading criminologists and developmental psychologists have avoided preemptively labelling constructs as protective or risk factors (Loeber & Farrington, 2012; Lösel & Farrington, 2012; Stouthamer-Loeber et al., 1993). Instead of making a subjective decision about whether to call a factor "protective," they empirically test whether a factor exerts a protective effect by classifying adolescents into three groups: (1) those showing strengths (e.g., scores falling in the

upper 25th percentile), (2) those showing deficits (e.g., scores falling in the lower 25th percentile), and (3) those falling in the middle range (e.g., scores falling between the 25th to 75th percentiles; Loeber & Farrington, 2012). If adolescents with strengths are less likely to reoffend, the construct is interpreted to have a protective effect. If adolescents with deficits are more likely to reoffend, the construct is interpreted to have as a risk effect. If both are true, the construct is interpreted to have both protective and risk effects. Although this approach enables researchers to make empirically-informed decisions about which factors are truly protective, it has not yet been applied to research on risk assessment tools.

Direct and/or Buffering Effects. Third, researchers have proposed a couple of possible mechanisms to help explain how protective factors may operate (e.g., Fergus & Zimmerman, 2005). Within the direct effect model, protective factors are thought to have similar importance for adolescents who are high vs. low risk (i.e., main effects). However, within the buffering model, protective factors may have a significantly stronger effect in mitigating risk among adolescents who are high risk than among those who are low risk (i.e., interaction with risk factors; Rutter, 1987). Although testing these mechanisms has the potential to refine our understanding of how to measure and interpret protective factors, to date, most research on the SAVRY and YLS/CMI has tested only direct effects. In one study, Lodewijks et al. (2010) tested whether SAVRY protective factors operated via a buffering model, but failed to find support for this model. However, additional research is needed.

Putatively Causal Factors. Fourth, risk assessment tools, such as the SAVRY and the YLS/CMI, strive to include risk and protective factors that are modifiable and causally-relevant to reoffending (Douglas & Skeem, 2005). However, proving causality is not an easy task. According to Kraemer's (1997) framework, two prerequisites must be met: (1) the factor must be able to change, and (2) within-individual changes in the factor must lead to subsequent changes in the outcome. In other words, the protective factors on the SAVRY and YLS/CMI should show increases or decreases due to factors such as life events (e.g., moving to a more stable or less stable home environment), treatment, or maturation. Moreover, these changes should, in turn, alter rates of reoffending.

Thus far, a study with adolescents in a residential treatment program for sexual offending, found that although SAVRY protective factors increased over the course of treatment, these increases did not translate into reductions in reoffending (Viljoen, Gray, Shaffer, Latzman, et al., 2017). In addition, a prior study from the current sample found that SAVRY protective factors showed some, modest change over time among adolescents on probation, but this study did not use statistical procedures, such as multilevel modelling, to test if within-individual increases in protective factors predicted subsequent decreases in offending (Viljoen, Shaffer, Gray, & Douglas, 2017). Research on the YLS/CMI is even scarcer. Even though some studies have examined changes in YLS/CMI risk total scores (Clarke, Peterson-Badali, & Skilling, 2017; Viljoen, Shaffer, et al., 2017), we are not aware of any research that has examined changes in YLS/CMI strengths, let alone how such change relates to reoffending. However, unless there is evidence that protective factors causally relate to reoffending, it cannot be assumed that targeting those factors in treatment will reduce reoffending (Monahan & Skeem, 2014).

Present Study

This study had four primary aims. First, given that the SAVRY and YLS/CMI conceptualize protective factors differently, we investigated the correspondence between these approaches and their relative ability to predict reoffending. Second, to inform debates about whether protective factors are distinct from risk factors, we examined their incremental validity over risk factors, and tested whether associations between protective factors and reoffending outcomes are driven by the strengths end of these measures (i.e., high scores) rather than the deficit end (i.e., low scores; Farrington, Ttofi, & Piquero , 2016). Third, to gain a clearer understanding of the mechanisms by which protective factors operate, we investigated whether protective factor total scores directly reduced reoffending (i.e., direct effect model) or if they interacted with risk factors (i.e., buffering model). Finally, to determine whether SAVRY protective factors and YLS/CMI strengths met criteria for causality (Kraemer et al., 1997), we measured protective factors at five time points (at baseline and at 3-, 6-, 9-, and 12-month follow-ups) and tested whether within-individual changes in protective factors predicted changes in reoffending.

By focusing on these conceptual issues, our goal was to gain greater clarity about what these tools measure, and inform debates about issues such as whether assessing protective factors holds value. We also attempted to build on past research by addressing some methodological limitations. For instance, we used a prospective design, wherein we assessed protective factors with a combination of interviews and file information, and measured reoffending using both official justice records and self-report.

We hypothesized that adolescents with high scores on protective factors would be less likely to reoffend. However, in light of other studies (Dickens & O'Shea, 2017), we did not expect that protective factors would add incremental validity over risk factors. Also, due to the lack of prior research, we were uncertain as to whether within-individual increases in protective factor scores would predict decreases in offending.

Method

All methods complied with ethical guidelines (i.e., American Psychological Association, 2010, 2013; Canadian Psychological Association, 2000; Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council, and Social Sciences and Humanities Research Council, 2014). Ethics approval for this research was obtained from Simon Fraser University and the research sites. In addition, we followed relevant reporting guidelines for risk assessment research (i.e., Singh, Yang, Mulvey, & the RAGEE Group, 2015).

Sample

Our sample comprised 156 adolescents on probation in a large Western city in Canada (107 males and 49 females). Participants had a mean age of 16.41 years ($SD = 1.14$, range = 12 to 18 years old). Over half of participants were from ethnic minority groups (61.5%, $n = 96$). Specifically, 38.5% ($n = 60$) were Caucasian, 29.5% ($n = 46$) were Indigenous (i.e., Canadian First Nations, Métis, Inuit), 12.8% ($n = 20$) were Asian (e.g., Chinese), 7.1% ($n = 11$) were South Asian (i.e., East Indian), 7.1% ($n = 11$) were Hispanic or Latino, and 4.5 % ($n = 7$) were African.

The ethnic and gender distribution of our sample is similar to national and provincial statistics of adolescent offenders in Canada (Calverley, Cotter, & Halla, 2010).

Over half of youth (59.6%, $n = 93$) had committed a violent offense and one-third had committed a property offense (36.5%, $n = 57$). On average, adolescents had been on probation for 5.82 months ($SD = 4.62$) prior to the baseline assessment. Most adolescents had no charges prior to the index offense (67.9%, $n = 106$). At the time of the baseline assessment, most adolescents were in grade 10 (37.4%, $n = 43$) or grade 11 (21.7%, $n = 25$). Over one-third of adolescents (38.8%, $n = 61$) had repeated a grade, and 5.8% ($n = 9$) had dropped out of school.

Most adolescents had received therapy at some point in their life (72.4%, $n = 113$), and the majority of adolescents (i.e., 70.5%, $n = 110$) had received treatment in the 3 months prior to the baseline assessment, such as individual therapy (60.9%, $n = 95$), drug and alcohol treatment (19.2%, $n = 30$), and school counseling (17.9%, $n = 28$). However, many of these treatments had not been empirically evaluated. Likewise, although the probation agency conducted risk-needs assessments with adolescents using a risk assessment tool, this tool had not yet been validated.

Procedure

This study is part of a larger study. Prior reports from this study have focused on risk factors rather than protective factors (Viljoen, Gray, Shaffer, Bhanwer, et al., 2017; Viljoen, Shaffer, et al., 2017).

RA Training. RAs included 11 graduate students, and 8 students with an undergraduate psychology degree who had prior coursework and/or experience with offender populations. Prior to the start of the study, RAs completed training on the study procedures and measures. Training on the SAVRY and YLS/CMI included two days of didactic training, followed by the completion of four or more practice cases. As a final step, trainees completed a SAVRY and a YLS/CMI assessment alongside an experienced RA. If their ratings did not show adequate correspondence with that of the experienced RA (i.e., total scores differed by 5 or more points), they completed additional practice cases until they achieved adequate correspondence. To help prevent rater drift, we held biweekly meetings, and a study manager monitored the RA ratings to ensure they were complete (i.e., there were no missing items). Interrater reliability was rated for a random sample of 31 baseline SAVRY and YLS/CMI assessment (i.e., 19.9% of the cases). In these cases, the two raters jointly interviewed the adolescent but rated the tools separately.

Recruitment and Consent. Adolescents at 11 probation offices ($n = 508$) were notified about the study via youth probation officers, study liaisons, posters, and flyers; we attempted to notify all adolescents at the sites. Approximately one-third of adolescents (32.1%, $n = 163$) did not meet the following eligibility criteria: (a) adjudicated for an offense and placed on probation, (b) between the ages of 12 and 18 years, and (c) residing in the metropolitan area of Vancouver, Canada. Also, 24.8% ($n = 126$) of youth were not interested in participating, and 5.1% ($n = 26$) could not be reached. Seven adolescents declined access to reoffense records, and thus were excluded from the study.[1]

Baseline Assessments. If eligible adolescents indicated that they were interested in

participating in the study, we obtained informed consent from their guardians. In 5.9% ($n = 30$) of cases, guardians could not be reached to provide consent; these adolescents were unable to participate. We also obtained adolescents' assent. To help ensure that adolescents had an adequate understanding of the study (e.g., that they could choose not to participate), we assessed adolescents understanding with a 6-item test, using this to correct any misunderstandings. After obtaining assent, RAs conducted a standardized interview with the adolescent at a probation office or a quiet public place (e.g., coffee shop). Adolescents also completed questionnaires, including the Self-Report of Offending (SRO; Huizinga, Esbensen, & Weiher, 1991). Afterwards, RAs reviewed the adolescent's youth justice file information (e.g., log of probation officers' contacts with the youth, records of program attendance, psychiatric reports, police reports), and rated the SAVRY and YLS/CMI based on interview and file information, using the coding guidelines in the tools' manuals. SAVRY and YLS/CMI items were pro-rated if 10% or fewer items were missing, consistent with instructions in the YLS/CMI manual (Hoge & Andrews, 2002). To compensate participants for their time, participants received a $20 stipend for the baseline assessment and a $15 stipend for each reassessment.

Reassessments. Adolescents were reassessed every 3 months over a 1-year period (i.e., at 3, 6, 9, and 12 months). At each reassessment, adolescents completed an interview, which focused on their recent functioning (i.e., past 3 months), and completed the SRO (Huizinga et al., 1991). Also, RAs reviewed recent file information. Whenever possible, the same RA conducted each of the assessments with the adolescent. To minimize missing follow-ups, RAs followed recommended practices outlined in Ribisl et al. (1996). For instance, they maintained contact with participants between follow-ups assessments, and used collateral sources (e.g., parents, service providers) to assist in locating an adolescent. In most cases, SAVRY and YLS/CMI reassessments were completed based on a combination of interview and file information. However, if efforts to complete a follow-up interview were not successful, SAVRY and YLS/CMI ratings were made based on file information alone, such as logs of probation officers' contacts with the youth and records of program attendance (i.e., 13.0% of cases, $n = 61$), provided that file information was sufficient (i.e., > 90% items could be rated).

Missing Follow-Ups. To test change over time and whether protective factors met criteria for putative causality, our goal was to complete at least one follow-up per adolescent. Of the 156 adolescents in the study, 145 (92.9%) had at least one follow-up SAVRY or YLS/CMI assessment. Specifically, 14 (9.0%) adolescents had one reassessment, 22 (14.1%) had two reassessments, 26 (16.7%) had three reassessments, and 83 (53.2%) had four reassessments for a total of 624 assessments. Adolescents with and without SAVRY and YLS/CMI reassessments did not differ significantly in demographic characteristics (i.e., age, gender, ethnicity, index offense, prior offenses) or SAVRY and YLS/CMI scores (i.e., risk and protective total scores). In addition, 129 adolescents (82.7%) had at least one follow-up SRO assessment. Specifically, 18 (11.5%) of adolescents had one follow-up SRO, 20 (12.8%) had two follow-up SROs, 21 (13.5%) had three follow-up SROs, and 70 (44.9%) had four follow-up SROs. Thus, the total number of completed SROs (including baseline SROs) was 557. Adolescents with and without missing follow-up SROs did not differ significantly in demographic variables or on SAVRY and YLS/CMI scores. Despite some missing data on the SRO, we successfully obtained official reoffense records for all of the participants in our sample.

Official Reoffense Records. Adult and youth justice records were collected through a province-wide justice database (i.e., Corrections Network System). We used a fixed follow-up period of 2 years, and examined both violent charges (i.e., "actual, attempted, or threatened infliction of bodily harm of another person"; Douglas, Hart, Webster, & Belfrage, 2013, pp. 36–37), and any charges (e.g., charges for violent offenses, property offenses, breaches, etc.). During the follow-up, 19.9% ($n = 31$) and 44.2% ($n = 69$) of adolescents were charged with violent and any reoffenses, respectively.

Measures

The Structured Assessment of Violence Risk in Youth (SAVRY). The SAVRY (Borum et al., 2006) is a structured professional judgement risk assessment tool that is designed to assess violence risk in adolescents aged 12 to 18. It includes 24 risk factors in Historical (e.g., history of violence), Social/Contextual (e.g., peer delinquency), and Individual/Clinical domains (e.g., risk-taking and impulsivity). It also includes the following six protective factors: prosocial involvement, strong social support, strong attachments and bonds, positive attitude towards intervention and authority, strong commitment to school, and resilient personality traits. Each risk factor is rated as Low, Moderate, or High, whereas each protective factor is rated as Present or Absent. Similar to other studies, we summed protective factors to create a Protective Total, and risk factors to create a Risk Total (Lodewijks et al., 2010). In the present study, interrater reliability (two-way random effect model for single raters, absolute agreement; McGraw & Wong, 1996) was good for the Protective Total and excellent for the Risk Total at baseline (intraclass correlation coefficients [ICC] = .70 and .91, respectively, $n = 31$; Shrout & Fleiss, 1979). The ICCs for the other SAVRY sections were also high (ICC = .85, .79, and .90 for Historical, Social/Contextual, and Individual/Clinical sections, respectively).

Youth Level of Service/Case Management Inventory (YLS/CMI). The YLS/CMI (Hoge & Andrews, 2002) is an adjusted-actuarial risk assessment tool that was developed to assess general recidivism risk in adolescents aged 12 to 18. It includes 42 dichotomous risk factors, which fall into eight domains (i.e., Prior and Current Offenses, Family Circumstances/Parenting, Education/ Employment, Peer Relations, Substance Abuse, Leisure/Recreation, Personality/ Behavior, and Attitudes/Orientation). These domains are summed to create a Risk Total. On each of the domains, except for Prior and Current Offenses, raters can check a box to indicate the presence of strengths in that domain. Consistent with prior research (Royer-Gagnier, 2013), we summed strength factors to create a Strength Total. Interrater reliability was excellent for the Risk Total at baseline (ICC = .82, $n = 31$; Shrout & Fleiss, 1979). In the training cases, raters showed some initial difficulties in achieving interrater reliability for the Strength Total. However, after training was completed, interrater reliability for Strength Total was excellent (ICC = .80). The ICCs for the YLS/CMI domains were fair to excellent (ICC = .90, .53, .77, .67, .54, .65, .88, and .61 for Prior and Current Offenses, Family Circumstances/Parenting, Education/ Employment, Peer Relations, Substance Abuse, Leisure/Recreation, Personality/ Behavior, and Attitudes/Orientation, respectively).

As the YLS/CMI was the version that was available at the time this study was initiated, we used the YLS/CMI (Hoge & Andrews, 2002) rather than the YLS/CMI 2.0 (Hoge & Andrews, 2011). The YLS/CMI 2.0 and YLS/CMI contain an identical set of strength items, but

the YLS/CMI 2.0 provides additional rating instructions. To determine the comparability of these versions, we coded both the YLS/CMI and the YLS/CMI 2.0 for a subset of cases ($n = 19$). The Spearman rho (r_s) correlation between strength totals on the two versions was extremely high ($r_{s =}.96$). Also, the mean (0.53) and median (0.00) strength totals did not differ for the YLS/CMI 2.0 and YLS/CMI ($U = 99.50$, $p = .310$), indicating the two versions are very similar.

Self-Report of Offending (SRO). In addition to measuring new charges, we measured self-report reoffending using the SRO (Huizinga et al., 1991), a well-validated self-report scale which includes 23 offenses (e.g., stolen something from a store; Knight et al., 2004).[2] Youth reported whether they had committed each of these offenses never, once, a couple of times (i.e., "2 to 3 times"), or multiple times (i.e., "4 or more times") during the past 3 months. Prior to administering the SRO, RAs interviewed youth about major events that had occurred during the past 3 months (e.g., changes in schools) to facilitate their memory. We calculated an Any Offense Total by summing all 23 items, and a Violent Offense Total by summing the nine items that pertained to violence (e.g., beaten up or physically attacked somebody so badly they probably needed a doctor). In the current study, internal consistency was good to excellent (i.e., .91 and .81 for SRO Any Offense and Violent Offense Totals, respectively; Cicchetti, 1994). Consistent with other research, the SRO detected more reoffending than did official records (Farrington et al., 2007; Jolliffe & Farrington, 2014); in the present study, 23.1% ($n = 36$) of adolescents were charged with a new offense during the three-month follow-up, whereas 71.9% ($n = 87$) of adolescents self-reported offending during this period.

Data Analysis Plan

Correspondence Between the SAVRY and YLS/CMI. To examine associations between the SAVRY Protective Total and the YLS/CMI Strength Total, we conducted r_s correlations with SPSS Version 22.0 (IBM Corporation, 2013). To compare which tool detected more protective factors, we used McNemar's test for paired proportions (McNemar, 1947).

Distinctiveness of Protective and Risk Factors. To examine associations between risk and protective factors, we conducted r_s correlations. In addition, to test if protective factors showed incremental validity over risk factors, we conducted hierarchical negative binomial regression using the "MASS" package in R (Hilbe, 2011). Negative binomial regression was preferable to logistic regression as it allowed us to capture differences in the frequency of reoffending rather than simply its presence or absence (Walters, 2007). Following this, we trichotomized scores on protective factors into three groups: low scores ($< 25^{th}$ percentile), high scores ($> 75^{th}$ percentile), and middle scores ($25 - 75^{th}$ percentile), using the procedures outlined in Loeber and Farrington (2012). We then created dummy variables for low scores and high scores, and entered these variables simultaneously into negative binomial regression models, with middle scores as the referent group. This allowed us to determine if associations between protective factors and number of charges were driven by high scores and/or low scores.

Direct and/or Buffering Effects. To test whether protective factors operated via a direct effect model (i.e., main effect), we entered the SAVRY Protective Total or YLS/CMI Strength Total as the predictor in negative binomial regression models, with number of charges as the outcome. To test the buffering model (i.e., interaction effect), we mean-centered protective and

risk total scores and created product terms representing the interaction between protective and risk factors (Baron & Kenny, 1986; Holmbeck, 1997). Next, we entered the risk and protective total scores in block 1 followed by the interaction term in block 2. We also examined the speed of reoffending with Cox Proportional Hazards survival analyses, which were conducted with the R package "survival" (Fox & Weisberg, 2011); in these analyses, time-at-risk was calculated as the number of days between the baseline assessment and the date of the first reoffense, or the end of the follow-up period if the adolescent did not reoffend. Finally, to compare the predictive validity of the SAVRY Protective Total and YLS/CMI Strength Total, we calculated the area under the curve (AUC) of the receiver operating characteristic (ROC; Hanley & McNiel, 1982), and compared these scores using the DeLong, DeLong, and Clarke-Pearson (1988) test.

Criteria for Putatively Causal Factors. To test whether the SAVRY Protective Total and the YLS/CMI Strength Total met criteria for a putatively causal factor (i.e., if within-individual increases in protective total scores predicted decreases in offending) we conducted MLM using the GLIMMIX procedure in SAS, Version 12.1 (SAS Institute Inc., 2012). One advantage of MLM is that it uses likelihood-based estimation to incorporate all available data in the analysis (Kwok et al., 2008). Thus, it does not require that participants have the same number of measurement points or follow-ups. Given that our study design involved repeated assessments, we employed two-level models with measurement occasions (i.e., Level 1 of the model, $n = 624$) nested within individuals (i.e., Level 2 of the model, $n = 156$). This nested structure takes into account the dependency of measurements taken on the same individual by including both fixed effects (i.e., person-level averages) and random components (i.e., variance of fixed effects at the person level; Hedeker & Gibbons, 2006). As our outcome variable (i.e., number of offenses) involves count data, we used a Poisson distribution and conducted generalized linear mixed-effects modeling. Prior to constructing these models, we lagged each of our outcomes (i.e., time - 1) so that our models tested whether changes in protective factors were associated with changes in *subsequent* reoffending (i.e., offending that occurred in the 3 months following the changes in protective factors) rather than concurrent reoffending. We specified an unstructured covariance matrix to model random effects.

Results

Correspondence Between the SAVRY and YLS/CMI

The baseline SAVRY Protective Total and YLS/CMI Strength Total were significantly correlated, but these correlations fell in the small range ($r_s = .29$, $p < .001$; Cohen, 1988). In addition, although the SAVRY and YLS/CMI include a similar number of protective factors (i.e., six and seven items, respectively), significantly more adolescents were rated as having at least one protective factor on the SAVRY than on the YLS/CMI (McNemar's test $= 48.96$, $p < .001$). That said, overall scores were low on both measures. Specifically, on the baseline SAVRY Protective Total, 37.9% of adolescents ($n = 59$) received a score of zero and 27.6% ($n = 43$) received a score of one ($M = 1.34$, $SD = 1.52$, Median $= 1.00$). On the baseline YLS/CMI Strength Total, 77.6% of adolescents ($n = 121$) received a score of zero ($M = 0.37$, $SD = 0.87$, Median $= 0.00$).

Distinctiveness of Risk and Protective Factors

YLS/CMI Strength and Risk Total scores at baseline had a moderate correlation (r_s = -.37, $p < .001$), and SAVRY Protective and Risk Total scores had a large inverse correlation (r_s = -.54, $p < .001$; Cohen, 1988). Also, neither the SAVRY Protective Total nor the YLS/CMI Strength Total provided incremental validity over risk total scores in predicting any or violent charges (see Table 2), even though statistical power for this analysis appeared to be adequate (Peduzzi et al., 1996).[3]

However, the absence of risk did not automatically equate to high protective factors; 34.1% ($n = 15$) of the adolescents who were low risk on the SAVRY (i.e., risk total scores in the bottom 25th percentile) did not have high scores on SAVRY protective factors (i.e., scores of 2 or higher; see Figure 1). Similarly, 56.8% ($n = 21$) of the adolescents who were low risk on the YLS/CMI (i.e., risk total scores in the bottom 25th percentile) were rated as not showing any strengths on the YLS/CMI (see Figure 2). Furthermore, when the SAVRY Protective Total was trichotomized into high, low, and middle, scores, high scores on protective factors (i.e., scores of 2 or higher) predicted the absence of reoffending, whereas low scores on protective factors (i.e., scores of 0) did not predict the presence of reoffending (see Table 1). In other words, the associations between protective factors and reoffending appeared to be driven by the strength end rather than the deficit end of this scale. It was not possible to perform trichotomization analyses on the YLS/CMI strengths, as 77.6% ($n = 121$) of adolescents had a score of 0.

Direct and/or Buffering Effects

Consistent with a direct effect model, the baseline SAVRY Protective Total inversely predicted the presence, speed, and frequency of violent and any charges over the two-year follow-up period (see Tables 3 and 4). The baseline YLS/CMI Strength Total predicted the absence of any but not violent reoffending. AUCs for the SAVRY Protective Total and YLS/CMI Strength Total fell in the range of what is considered a small effect (i.e., .60 to .62; Rice & Harris, 2005), with no significant differences in AUCs between the two measures (i.e., z = -0.36 and -0.11, $p > .05$ for violent and any charges, respectively). Contrary to the buffering model, the strength of associations between protective total scores and offending outcomes did not vary by risk level (i.e., there were no signification interactions at $p < .05$; see Table 4).

Criteria for Putatively Causal Factors

Protective factors appeared to show some change over time. For instance, from baseline to the 3-month follow-up, 28.1% ($n = 39$) of adolescents showed an increase of 1 or more points on the SAVRY Protective Total and 12.7% ($n = 18$) of adolescents showed an increase on the YLS/CMI Strengths Total. Conversely, 22.3% ($n = 31$) and 11.3% ($n = 16$) showed a decrease of 1 more points on the SAVRY Protective Total and YLS/CMI Strength Total, respectively.

To test whether increases in protective factors predicted decreases in reoffending, we conducted MLM, using the recommended model-building procedures (Raudenbush & Bryk, 2002; Singer & Willett, 2003). As a first step, we conducted unconditional mean and unconditional growth models to test if there was sufficient variability in offending to proceed with analyses. These analyses indicated that official *charges* showed limited between-person

variability, resulting in poor model fit (i.e., $\chi^2/df = 0.14$ and $\chi^2/df = 0.21$ for violent and any charges, respectively). In contrast, *self-reported offending* showed sufficient between-person variability ($\chi^2/df = 0.95$ and $\chi^2/df = 2.31$ for violent and any offending, respectively), and sufficient change or growth over time ($\beta = -0.28$, SE = 0.09, $p < .01$ and $\beta = -0.13$, SE = 0.06, $p < .05$ for violent and any reoffending, respectively). This indicated that although it was feasible to test associations between within-individual changes in protective factors and self-reported offending, it was not feasible to test associations between changes in protective factors and charges. In other words, self-reported offending appeared to be a more sensitive outcome measure than did official charges.

Thus, as a next step, we conducted conditional growth models of the within-person effects of protective factors, using self-reported violent and any reoffending as outcomes. To do so, we calculated the amount that each adolescent's protective total scores changed relative to his or her own mean score (i.e., person mean-centered scores, representing within-person effects). We also modeled time as both a fixed and random effect in the MLM models to account for the variability in the intercepts and slopes of offending over time across participants. All outcomes were lagged by 3 months so that we could test if changes in protective factors were able to predict changes in reoffending in the subsequent 3 months. Results indicated that within-individual increases in the SAVRY Protective Total and YLS/CMI Strength Total significantly predicted subsequent decreases in self-reported *violent* reoffending. However, they did not predict decreases in *any* reoffending (see Table 5).

Next, to compare whether between-person effects were more predictive of reoffending than within-person effects, we added adolescents' mean protective total scores, averaged across the five measurement occasions (representing between-person effects), to the above model. Adolescents' mean SAVRY Protective Total and YLS/CMI Strength Total inversely predicted reoffending, but within-person changes in scores were no longer predictive (see Table 5).

Discussion

To examine whether the SAVRY Protective Total and YLS/CMI Strength Total predict reoffending, and if so, how they operate, we conducted a prospective, repeated measures study. In general, our results provide some support for these measures, but also point to future directions.

Primary Findings

Rates of Identified Protective Factors Were Low. Similar to previous research (e.g., Chu et al., 2015; Shepherd, Luebbers, & Ogloff, 2016), most adolescents in our sample were rated as having no protective factors or only a single protective factor. In other words, the SAVRY and YLS/CMI appear to primarily capture *deficits* in protective factors rather than strengths. The low rate of protective factors in our sample could indicate that many adolescents in our sample truly do not have any protective factors. However, a more likely possibility is that these adolescents do, in fact, have some protective factors but these factors may not be fully captured by the SAVRY and YLS/CMI. Given that the SAVRY and YLS/CMI only include a very brief number of dichotomous protective factors (i.e., six or seven), they may not detect

protective factors that are only partially present, or protective factors that are not included within the small pool of items. This appears potentially problematic; one of the goals of assessing protective factors is to provide a more balanced perspective of adolescents and reduce stigma that may be caused by focusing only on adolescents' deficits. However, if tools frequently lead to conclusions that an adolescent does not have *any* protective factors or strengths, it might increase rather than decrease stigma.

Even though both tools detected low rates of protective factors, the YLS/CMI detected significantly fewer protective factors than did the SAVRY; 77.6% of adolescents were rated as having no strengths on the YLS/CMI vs. 37.9% on the SAVRY. We believe that this is likely due to differences in the structure and format of the tools. In particular, despite having a similar number of protective factors, the SAVRY places a more explicit focus on protective factors than does the YLS/CMI. On the YLS/CMI, assessors simply check off areas that they perceive to be strengths; few instructions are provided. As a result, assessors may overlook strengths, or infer that strengths are rare. The newer version of the YLS/CMI, the YLS/CMI 2.0 (Hoge & Andrews, 2011), aims to increase attention to strengths by providing assessors with additional rating instructions. However, when we compared the YLS/CMI and YLS/CMI for a subset of adolescents, we found that the YLS/CMI 2.0 also detected very few strengths (Median = 0).

Protective Factors Overlap with Risk Factors But Are Not Mirror Images. Based on our results, risk and protective factors showed moderate to large inverse correlations. This finding is not surprising given the overlap in content. On the YLS/CMI, the same constructs are rated for both risks and strengths. Also, even though the SAVRY includes a separate section on protective factors, a number of SAVRY protective factors are the positive pole of a risk item on the SAVRY. For instance, the SAVRY includes strong school commitment as a protective factor and low school commitment as a risk factor. As another example, it includes strong social support (protective factor) and low social support (risk factor). Given this overlap, it is not surprising that protective factors did not add incremental validity over risk factors (see also Dickens & O'Shea, 2017), especially as the SAVRY and YLS/CMI have four times as many risk factors as protective factors.

That said, despite some correspondence, the risk and protective factors on the SAVRY and YLS/CMI do not appear to be simply *mirror images*. For instance, only 34.1% of adolescents who were rated as low risk on the SAVRY had two or more SAVRY protective factors. In other words, low risk is not necessarily the equivalent of high strength. Furthermore, in the current study, the associations between SAVRY protective factors and reoffending appeared to be driven by the strengths end of this scale (i.e., high scores) rather than the deficit end (i.e., low scores), thus indicating that they meet Loeber's and Farrington's (2012) criteria for a protective effect.

Protective Factors Predicted Reduced Reoffending Via a Direct Effect Model. Consistent with prior research (e.g., Lodewijks et al., 2010), SAVRY Protective Total scores inversely predicted violent and any charges, with AUCs in the small range. Also, the YLS/CMI Strength Total inversely predicted any charges (with small but significant AUCs) but not violent charges. This may be because the YLS/CMI is designed to predict general rather than violent offending.

Protective factors did not significantly interact with risk factors in any of the models. Instead, they appeared to have a compensatory impact, directly reducing likelihood of reoffending for adolescents regardless of their risk level (see also Lodewijks et al., 2010). Thus, this finding suggests that protective factors are of similar importance to adolescent offenders of varying risk levels, rather than being especially important for high risk youth. However, it is also possible that our failure to find a significant interaction effect may be due, in part, to low power. Although there are no clear guidelines on the required sample size for testing interaction effects in regression models, Fleiss (1986) has suggested that sample size required might be four-fold what would be needed to detect a single main effect of a similar magnitude. Thus, although the interaction between SAVRY risk and protective factors did not quite reach significance for the outcome of any charges ($p = .067$), it might have with a larger sample.

Within-Individual Increases in Protective Factors Predicted Decreases in Violence. Not only did protective factors inversely predict new charges, SAVRY Protective Total and YLS/CMI Strength Total scores also appeared to meet Kraemer et al.'s (1997) criteria for causal factors. Specifically, increases in protective total scores predicted reduced likelihood of self-reported violent reoffending in the subsequent 3 months. In our previous research with this sample, increases in risk total scores on the SAVRY and YLS/CMI failed to predict subsequent increases in self-reported violent reoffending (Viljoen, Gray, Shaffer, Bhanwer, et al., 2017). As such, it is quite remarkable that, in the current examination, these brief measures of protective factors met the threshold for possible causality even though risk total scores did not.

These findings suggest that SAVRY protective factors and YLS/CMI strengths might serve as important treatment targets for the prevention of violence. However, as this study was not an experimental design, causality is impossible to prove. Also, even though within-person changes in protective factors predicted self-reported violent reoffending, between-person effects (i.e., adolescents' mean protective total scores across assessment periods) were more robust than within-person changes. Thus, in predicting violent reoffending, it may be at least as important to understand an adolescent's typical or mean level of protective factors as it is to know how much his or her protective factors have increased or decreased from this mean. That said, with more sensitive tools and/or with more effective treatments, we might find greater improvements in protective factors and, in turn, stronger associations between protective factors and decreases in reoffending.

Limitations

Although this study is the first to use an intensive repeated measures design to examine whether increases in SAVRY protective factors and YLS/CMI strengths predicted decreases in reoffending, we encountered missing data as a result of our longitudinal design. In particular, although we obtained reoffense records for all participants, 7.1% of participants did not have at least one SAVRY or YLS/CMI follow-up assessment and 17.3% of participants did not have at least one follow-up SRO. Rates of missing follow-ups were comparable to or lower than other studies (e.g., Monahan, Steadman, & Silver, 2001), but higher than some studies (e.g., Schubert et al., 2004). To minimize the effects of missing data, we used MLM analyses, as it incorporates all available time points (Hedeker & Gibbons, 2006).

Consistent with recommended practices, RAs rated the SAVRY and YLS/CMI using a combination of interviews and file information ($n = 563$). However, if an adolescent missed their interview, and file information was deemed sufficient to rate the tools, we coded these tools from file information alone ($n = 61$). Although file coding is common (see Viljoen, Mordell, & Beneteau, 2012), it is less ideal. Also, as recommended, we measured offending through both official records (e.g., charges) and self-reported offending (Jolliffe & Farrington, 2014). However, official records underestimate true reoffense rates (Farrington et al., 2007; Jolliffe & Farrington, 2014), and even though self-reported offending measures generally have been found to have good reliability and validity, some youths' self-reports may be unreliable. In addition, because this longitudinal study began prior to the publication of the YLS/CMI 2.0, we used the YLS/CMI (Hoge & Andrews, 2002). Although we found high correspondence between strengths scores on the YLS/CMI 2.0 and YLS/CMI ($r_s = .96$), future research is needed.

Another potential limitation is that, similar to other risk assessment studies, RAs coded multiple tools (i.e., SAVRY and YLS/CMI). As such, RAs' ratings on one tool might influence their rating on another tool. Furthermore, whenever possible, the same RA conducted each of the follow-up assessments of an adolescent. Although this is similar to clinical practice, it means that RAs were not blind to the prior ratings. Finally, we were unable to meaningfully test the generalizability of our findings across sex and race/ethnicity because the sample was racially and ethnically diverse, making it difficult to collapse ethnic minority adolescents into a single group, and relatively few girls participated ($n = 49$). As such, there is a need for future research.

Implications for Research and Practice

Based on the results of the present study, the SAVRY provides a reasonable approach to measure protective factors in adolescent offenders. The YLS/CMI Strengths, though less well-researched, also showed promise, as it inversely predicted any charges. However, effect sizes for both the SAVRY Protective Total and the YLS/CMI Strength Total were small. Furthermore, assessors should recognize that these measures are best thought of as screening approaches rather than comprehensive measures of protective factors. As such, scores of 0 should not be interpreted to mean that an adolescent, literally, does not have any strengths. For this reason, assessors should be careful in how they communicate these results to adolescents and their families, and to judges and other decision-makers.

Assessors should also be aware that the protective factors on these tools show some overlap with risk factors. Indeed, even though the protective factors on the SAVRY are packaged as a separate section, some SAVRY protective factors are the positive pole of SAVRY risk factors. This overlap between risk and protective factors does not necessarily undermine the importance of protective factors. Rather, risk and protective factors on these measures can perhaps be thought of as 'two sides of the same coin.'

Besides these clinical implications, our findings point to several areas for future research. In particular, although several lengthier measures of protective factors have been recently developed, including the Structured Assessment of Protective Factors: Youth Version (SAPROF:YV; de Vries Robbé, Geers, Stapel, Hilterman, & de Vogel, 2015) and the Short-Term Assessment of Risk and Treatability: Adolescent Version (START:AV; Viljoen, Nicholls,

Cruise, Desmarais, & Webster, 2014), research on these tools is needed. Researchers also should conduct more basic-level research on protective factors so as to expand the repertoire of items on measures. Rather than recycling items that are already included in tools as risk factors, researchers should generate new ideas by examining other fields, such as developmental assets, positive psychology, and desistance. Furthermore, rather than focusing on adolescents who are already deep within the justice system, researchers should study and learn from adolescents who have avoided offending altogether, and/or successfully desisted from offending.

There is also a pressing need for research on how risk and protective factors are distinct, and if assessing protective factors has utility or practical value, as this has become the unspoken 'elephant in the room.' At this point, researchers should not prematurely dismiss protective factors as unimportant because they have moderate to large inverse correlations with risk factors, or because they do not consistently provide incremental validity over much lengthier measures of risk factors. Instead, they should strive to empirically untangle the nature of protective factors, and test not only how such factors may be relevant to risk prediction, but also how they might facilitate intervention-planning, treatment engagement, and risk communication.

Endnotes

[1] These seven excluded adolescents did not differ significantly from other participants in their demographic characteristics (i.e., age, gender, ethnicity, index offense, prior charges), or their SAVRY and YLS/CMI risk total scores.

[2] We did not include the question "shot and killed someone" due to the low base rate and the possibility that this might raise concerns about confidentiality.

[3] We calculated the minimum required sample size using Peduzzi's et al.'s (1996) formula for non-linear regression (i.e., 10 k/p, where k equals the number of independent variables to be included in the model and p equals the smallest proportion of negative or positive cases in the population). We had two variables in the model and the proportion of positive cases was equal to 19.9% and 44.2% for violent and any reoffending respectively. Thus, the minimum sample size required to detect a significant result ranged between 45 and 100; our sample size exceeded this value ($n = 156$).

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Table 1

Effects of Low and High SAVRY Protective Total Scores: Negative Binomial Regression Models

	Deficit End (i.e., Low Scores on SAVRY Protective Factors) vs. Middle Scores			**Strengths End** (i.e., High Scores on SAVRY Protective Factors) vs. Middle Scores		
	b (SE)	Exp(B) [95% CI]	*p*	*b* (SE)	Exp(B) [95% CI]	*p*
Violent Charges	0.08 (.30)	1.09 [0.61, 1.94]	.780	-1.38 (.39)	0.25 [0.12, 0.54]	.001
Any Charges	0.25 (.23)	1.28 [0.82, 2.01]	.279	-0.92 (.25)	0.40 [0.25, 0.65]	.001

Note. b = unstandardized regression coefficient; SE = standard error of *b*; Exp(B) = odds ratio; 95% CI = 95% confidence intervals of Exp (b).

Table 2

Incremental Validity of Protective Factors: Negative Binomial Regression Models

	Number of Violent Charges				**Number of Any Charges**			
	b (SE)	Exp(b) [95% CI]	*z*	*p*	*b* (SE)	Exp(b) [95% CI]	*z*	*p*
SAVRY								
Block 1								
Risk Total	0.12 (0.03)	1.13 [1.07, 1.20]	4.03	< .001	0.12 (0.02)	1.13 [1.08, 1.18]	6.19	<.001
		$\chi^2(1) = 19.26, p < .001$				$\chi^2(1) = 35.46, p < .001$		
Block 2								
Protective Total	-0.04 (0.21)	0.96 [0.59, 1.56]	-0.18	.859	0.09 (0.14)	1.09 [0.82, 1.46]	0.64	.525
		$\chi^2(2) = 19.28, p < .001, \Delta\chi^2(1) = 0.02, p = .990$				$\chi^2(2) = 35.98, p < .001, \Delta\chi^2(1) = 0.52, p = .771$		
YLS/CMI								
Block 1								
Risk Total	0.12 (0.03)	1.12 [1.06, 1.20]	3.47	.001	0.14 (0.02)	1.15 [1.10, 1.20]	6.17	<.001
		$\chi^2(1) = 14.48, p < .001$				$\chi^2(1) = 40.11 \ p < .001$		
Block 2								
Strength Total	-0.30 (0.42)	0.74 [0.28, 1.73]	-0.72	.471	-0.39 (0.28)	0.67 [0.37, 1.20]	-1.42	.154
		$\chi^2(2) = 15.38, p < .001, \Delta\chi^2(1) = 0.90, p = .343$				$\chi^2(2) = 42.47, p < .001, \Delta\chi^2(1) = 2.36, p = .307$		

Note. *b* = unstandardized regression coefficient; *SE* = standard error of *b*; Exp(b) = Odds ratio; 95% CI = 95% confidence intervals of Exp (b); z = z-test statistic.

Table 3

Protective Factors and Reoffending: ROC Analyses and Cox Proportional Hazards Model

	ROC Analyses		Cox Proportional Hazards Model			
	AUC [95% CI]	*p*	*b* (SE)	HR [95% CI]	Wald	*p*
Violent Charge						
SAVRY Protective Total	.62 [.52, .72]	.044	-0.37 (0.17)	0.69 [0.50, 0.96]	4.88	.027
YLS Strength Total	.60 [.50, .70]	.088	-0.91 (0.52)	0.40 [0.15, 1.11]	3.08	.079
Any Charge						
SAVRY Protective Total	.61 [.52, .69]	.023	-0.28 (0.10)	0.76 [0.63, 0.92]	8.02	.005
YLS Strength Total	.60 [.51, .69]	.031	-0.72 (0.28)	0.49 [0.28, 0.84]	6.82	.009

Note. ROC = Receiver operating characteristic. AUC = area under the curve of the receiver operating characteristic; 95% CI = confidence intervals of AUC. Scores were reversed for the AUC analysis so that protective factors scores predicted absence of reoffending. *b* = unstandardized regression coefficient; *SE* = standard error of *b*; HR = Hazard ratio; 95% CI = 95% confidence intervals of HR.

Table 4

Direct vs. Buffering Effect Model: Negative Binomial Regression

	Number of Violent Charges				**Number of Any Charges**			
	b (SE)	Exp(b) [95% CI]	*z*	*p*	*b* (SE)	Exp(b) [95% CI]	*z*	*p*
SAVRY								
Direct Effect Model								
Protective Total	-0.55 (0.20)	0.58 [0.37, 0.86]	-2.80	.005	-0.37 (0.11)	0.69 [0.54, 0.91]	-3.09	.002
		$\chi^2(1) = 7.10, p = .008$				$\chi^2(1) = 7.38, p = .007$		
Buffering Model								
Block 1								
Protective Total	-0.04 (0.21)	0.96 [0.59, 1.56]	-0.18	.858	0.09 (0.14)	1.09 [0.82, 1.46]	0.64	.525
Risk Total	0.12 (0.04)	1.12 [1.05, 1.21]	3.30	.001	0.13 (0.02)	1.14 [1.08, 1.20]	5.42	.001
		$\chi^2(2) = 19.31, p < .001$				$\chi^2(1) = 35.98, p < .001$		
Block 2								
Risk x Protective	0.02 (0.03)	1.02 [0.97, 1.09]	0.69	.491	0.03 (0.02)	1.03 [1.00, 1.07]	1.83	.067
	$\chi^2(3) = 19.87, p < .001, \Delta\chi^2(1) = 0.86\ p = .353$				$\chi^2(3) = 40.88, p < .001, \Delta\chi^2(1) = 4.90, p = .027$			
YLS/CMI								
Direct Effect Model								
Strength Total	-0.95 (0.47)	0.39 [0.14, 0.90]	-2.04	.041	-1.07 (0.30)	0.34 [0.18, 0.63]	-3.50	.001
		$\chi^2(1) = 4.85, p = .028$				$\chi^2(1) = 12.11\ p < .001$		
Buffering Model								
Block 1								
Strength Total	-0.30 (0.42)	0.74 [0.28, 1.73]	-0.72	.471	-0.39 (0.28)	0.67 [0.37, 1.20]	-1.42	.154
Risk Total	0.10 (0.04)	1.11 [1.04, 1.19]	2.96	.003	0.12 (0.02)	1.13 [1.08, 1.19]	5.28	.001
		$\chi^2(2) = 15.39, p < .001$				$\chi^2(2) = 42.47, p < .001$		
Block 2								
Risk x Strength	-0.02 (0.04)	0.98 [0.89, 1.13]	-0.50	.615	0.00 (0.04)	1.00 [0.94, 1.11]	0.01	.989
	$\chi^2(3) = 15.67, p = .001, \Delta\chi^2(1) = 1.28, p = .258$				$\chi^2(3) = 42.48, p < .001, \Delta\chi^2(1) = 0.01, p = .920$			

Note. b = regression coefficient; *SE* = standard error of *b*; Exp(b) = Odds ratio; 95% CI = 95% confidence intervals of Exp (b).
z = z-test statistic.

Table 5

Putatively Casual Model: MLM with Self-Reported Offending Outcomes

| | SAVRY Protective Total | | | | | | YLS/CMI Strength Total | | | | | |
	Within-Person Effects			Between vs. Within-Person Effects			Within-Person Effects			Between vs. Within-Person Effects		
SRO Violent Reoffending												
Fixed Effects	**β**	**SE**	*df*	**β**	**SE**	*df*	**β**	**SE**	*df*	**β**	**SE**	*df*
Intercept	0.69**	0.25	127	0.79**	0.25	127	0.44	0.22	127	0.56*	0.22	126
Time	-0.34**	0.10	107	-0.30**	0.10	108	-0.30**	0.09	109	-0.28**	0.09	109
<u>Protective Total Change</u>	-0.25*	0.12	60	-0.07	0.16	64	-0.32*	0.13	148	-0.18	0.15	148
Mean Protective Total	–	–	–	-0.40**	0.12	87	–	–	–	-0.82**	0.28	148
Variance Components	σ^2_v	**SE**		σ^2_v	**SE**		σ^2_v	**SE**		σ^2_v	**SE**	
Intercept	1.64**	0.64	–	1.80**	0.57	–	1.84**	0.56	–	1.88**	0.57	–
Time	0.15**	0.06	–	0.14*	0.06	–	0.13**	0.05	–	0.13**	0.05	–
Protective Total	0.47**	0.19	–	0.48*	0.21	–	–	–	–	–	–	–
Model Fit (χ^2/df)	0.52			.52			0.69			0.70		
SRO Any Reoffending												
Fixed Effects	**β**	**SE**	*df*	**β**	**SE**	*df*	**β**	**SE**	*df*	**β**	**SE**	*df*
Intercept	1.31***	0.21	127	1.60**	0.22	127	1.22***	0.20	126	1.41**	0.20	125
Time	-0.15*	0.06	107	-0.12*	0.06	108	-0.17*	0.07	109	-0.15*	0.06	109
<u>Protective Total Change</u>	-0.14	0.09	62	0.03	0.12	66	-0.24	0.14	37	0.03	0.16	37
Mean Protective Total	–	–	–	-0.42**	0.10	93	–	–	–	-0.94**	0.24	120
Variance Components	σ^2_v	**SE**		σ^2_v	**SE**		σ^2_v	**SE**		σ^2_v	**SE**	
Intercept	2.36***	0.55	–	2.56***	0.53	–	3.15***	0.63	–	2.94***	0.60	–
Time	0.17**	0.05	–	0.15**	0.04	–	0.22***	0.05	–	0.22***	0.05	–
Protective Total	0.36**	0.12	–	0.38**	0.13	–	0.46*	0.28	–	0.50*	0.27	–
Model Fit (χ^2/df)	0.74			0.73			0.96			0.95		

Note. Level 2 (between-person) effects are italicized. The within-person effects representing changes in Protective Total scores from persons' mean Protective Total score is underlined. For YLS/CMI Strength Total within-person effects with violent reoffending, the YLS/CMI Strength Total score was removed as a random effect due to issues with convergence. * $p < .05$, ** $p < .01$ (two-tailed).

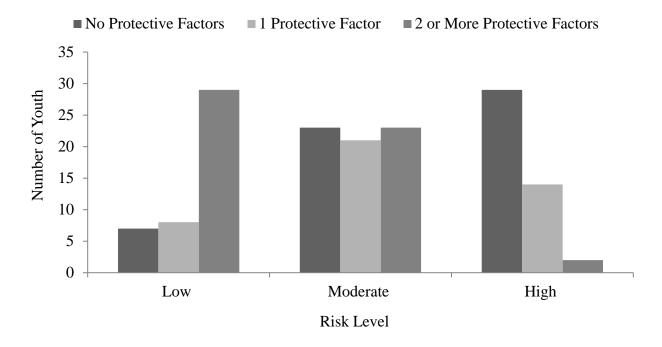*Figure 1. Distributions of SAVRY Protective Factors and Risk Factors by Percentile Cut-off Scores.* Percentile cut-offs were as follows: Low = < 25th percentile, Moderate = 25th to 75th percentile, High = > 75th percentile. On the SAVRY Risk Factors Total, the categories of low, moderate, and high equated to scores of 21, 26, and 32 out of a possible score of 48.
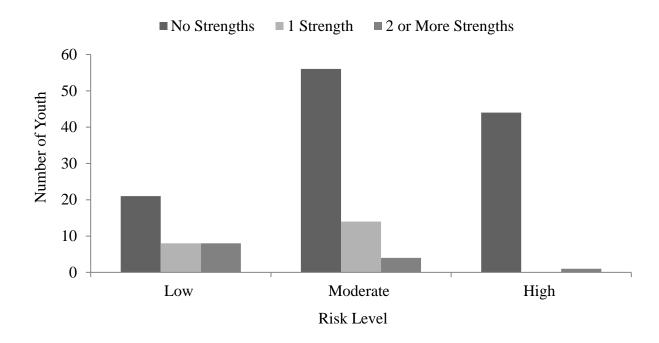
Figure 2. Distribution of YLS/CMI Strengths and Risk Factors by Percentile Cut-Off Scores.
Percentile cut-offs were as follows: Low = < 25th percentile, Moderate = 25th to 75th percentile,
High = > 75th percentile. On the YLS/CMI Risk Factors Total, the categories of low, moderate,
and high equated to scores of 14, 20, and 25 out of a possible score of 42.