# An Evaluation of the Predictive Validity of the SAVRY and YLS/CMI in Justice-Involved Youth with Fetal Alcohol Spectrum Disorder

Kaitlyn McLachlan
University of Guelph

Andrew L. Gray, Ronald Roesch, Kevin S. Douglas, & Jodi L. Viljoen
Simon Fraser University

Psychological Assessment

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Author Note:

Kaitlyn McLachlan, Department of Psychology, University of Guelph. Andrew L. Gray, Ronald Roesch, Kevin S. Douglas, and Jodi L. Viljoen, Department of Psychology, Simon Fraser University.

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Correspondence regarding this article should be addressed to Dr. Kaitlyn McLachlan , Department of Psychology, University of Guelph, 50 Stone Road East, Guelph, Ontario, Canada, N1G 2W1.

Abstract

Despite the high prevalence of fetal alcohol spectrum disorder (FASD) in youth criminal justice settings, there is currently no research supporting the use of violence risk assessment tools in this population. This study examined the predictive validity of total and domain scores on the Structured Assessment of Violence Risk in Youth (SAVRY) and the Youth Level of Service/Case Management Inventory (YLS/CMI) in justice-involved youth with FASD. Participants were 100 justice-involved youth (ages 12 to 23, 81% male), including 50 diagnosed with FASD and 50 without FASD or prenatal alcohol exposure. The SAVRY and YLS/CMI were prospectively coded based on interview and file review, with recidivism (both any and violent specifically) coded one-year post baseline assessment. Results provide preliminary support for the validity of the SAVRY and YLS/CMI in predicting recidivism in justice-involved youth with FASD. Higher ratings across SAVRY and YLS/CMI domains were found in youth with FASD, underscoring a critical need for assessments and interventions to buffer recidivism risk and address clinical needs.

Keywords: Fetal alcohol spectrum disorder, violence risk assessment, forensic assessment, justice-involved youth, prenatal alcohol exposure.

Public Significance Statement: This study provides preliminary support for the use of youth risk assessment instruments (SAVRY and YLS/CMI) among justice-involved youth with fetal alcohol spectrum disorder (FASD). Risk predictions did not differ between youth with and without the disability, though youth with FASD were rated as higher risk across most domain, total, and categorical risk ratings, relative to comparison youth, underscoring a high level of risk and intervention need in this population.

# An Evaluation of the Predictive Validity of the SAVRY and YLS/CMI in Justice-Involved Youth with Fetal Alcohol Spectrum Disorder

Fetal alcohol spectrum disorder (FASD) comprises a range of impairments linked with prenatal alcohol exposure (PAE), including neurocognitive deficits, problems regulating affect and behavior, and in a smaller number of cases, characteristic sentinel facial features and/or growth restriction (Chudley et al., 2005; Cook et al., 2015). Limited availability of prevalence estimates suggest that FASD occurs at higher rates in criminal justice contexts (10 to 23%) compared to the general population (2% to 5%) (May et al., 2014; Popova, Lange, Probst, Gmel, & Rehm, 2017). These rates are considered conservative, as most clinicians lack the training to recognize or diagnose the disability, and many individuals do not present with obvious physical indicators, leading to a relative "invisibility" of FASD (Chudley et al., 2005).

Research suggests that as many as 60% of individuals with FASD experience contact with the criminal justice system and that youth with FASD are 19 times more likely to be incarcerated compared to youth without the disorder (Clarren et al., 2015; Popova, Lange, Bekmuradov, & Mihic, 2011; Streissguth et al., 2004). Though not systematically studied, there is growing consensus that the experiences and needs of youth with FASD greatly increase their likelihood of contact with the justice system (Fast & Conry, 2009; Hughes, Clasby, Chitsabesan, & Williams, 2016). FASD is frequently characterized by neurocognitive deficits including problems with executive functioning, memory, attention, academic skills, learning, communication, and adaptive functioning. Functionally, this can cause an array of problems, including poor reasoning, judgment, impulse control, and learning from cause and effect, in addition to emotional and behavioral dysregulation (Mattson, Crocker, & Nguyen, 2011). Further compounding risk, youth with FASD experience high rates of lifetime adversity, including caregiver disruption, foster care, victimization, poverty, and school failure (McLachlan et al., 2016; Streissguth et al., 2004). A recent Canadian study based on archival data showed that incarcerated youth with FASD had significantly higher rates of criminogenic risk factors, including a history of placement in foster care, comorbid behavioral disorders, low self-control, a negative self-identity, and an earlier age of first alcohol use, relative to a group of incarcerated youth without FASD (Corrado & McCuish, 2015). Studies also show comorbid mental health diagnoses in as many as 90% of individuals with FASD (Pei, Denys, Hughes, & Rasmussen, 2011). Taken together, this constellation of factors places many youth with FASD at high risk for contact with the criminal justice system.

## Risk Assessment

Forensic clinicians are often asked to evaluate the risk level and intervention needs of justice-involved youth. Viljoen, McLachlan, and Vincent (2010) found that 91% of clinicians surveyed had assessed the likelihood of violence or reoffending while conducting court ordered assessments of juvenile offenders. Among these, 61% of clinicians reported using formal risk assessment tools in their evaluations, including both the Structured Assessment of Violence Risk in Youth (SAVRY; Borum, Bartel, & Forth, 2006) and Youth Level of Service/Case Management Inventory (YLS/CMI; Hoge & Andrews, 2002). Tools such as the SAVRY and YLS/CMI aid evaluators in structuring their decisions by identifying risk/need markers associated with increased risk for violence and general recidivism, respectively, as well as

protective factors linked with decreased risk. There is growing evidence that both the SAVRY and YLS/CMI aid evaluators in providing valid and reliable risk estimates for justice-involved youth (Olver, Stockdale, & Wormith, 2009, 2014; Singh, Grann, & Fazel, 2011). However, to our knowledge, no studies have evaluated their use in youth with FASD.

Given the lack of research on offenders with FASD, it is difficult to identify a comparable evidence-base in the risk tool literature. FASD is a disorder characterized by compromised neurocognitive functioning and high rates of mental health problems, suggesting that both the intellectual disability (ID) and mental health literatures form logical starting points. Experts have debated the appropriateness of using risk assessment tools without supplementary guides or specialized training in the ID population (Lofthouse, Lindsay, Totsika, Hastings, & Roberts, 2014; Verbrugge, Goodman-Delahunty, & Frize, 2011). There are limited studies on risk assessment tools in the adolescent ID literature, and fewer focusing explicitly on justice-involved youth with mental health problems. Gammelgård and colleagues (2008) found comparable predictive accuracy of the SAVRY in female adolescents with developmental disabilities and other mental health conditions relative to those with schizophrenia spectrum disorders, disruptive behavioral, and personality disorders. Frize, Kenny, and Lennings (2008) found that youth with ID were rated at higher risk to reoffend compared to those without ID, using an Australian Adaptation of the YLS/CMI in a sample of 800 juvenile offenders; though they did not evaluate outcome data in relation to YLS/CMI scores.

Khanna and colleagues (2014) found that the SAVRY had better predictive accuracy compared to the YLS/CMI in justice-involved youth with comorbid attention-deficit/hyperactivity disorder (ADHD) and conduct disorder (CD), and that predictive accuracy was better for both tools in those with only CD, compared to the comorbid group. Guebert and Olver (2014) evaluated relationships between psychopathology, substance abuse, risk, and recidivism in justice-involved youth using measures including the YLS/CMI. They found that those with complex mental health needs (e.g., dual diagnosis, multiple mental health disorders) had more serious criminogenic need profiles using the YLS/CMI, but that the presence of cognitive disorders was unrelated to criminogenic risk. Overall, with the exception of CD and substance use pathology, mental health concerns tended not to be related to recidivism.

Despite growing evidence for the predictive validity of risk tools such as the SAVRY and YLS/CMI in a range of justice-involved youth populations, including those with ID and complex mental health concerns, it remains unclear whether results from these populations generalize to justice-involved youth with FASD. Risk factors that are driven by deficits in executive functioning (e.g., impulsivity) may contribute differentially to risk, and importantly, to effective management approaches when those deficits are linked with an underlying and complex brain injury. For instance, Haqanee and colleagues (2015) have suggested that some features of criminogenic needs, such as impulsivity or low frustration tolerance, may be more challenging for probation officers to effectively identify, particularly in the context of mental health problems such as ADHD or FASD, compared to when these features are present alone. It is unclear how these challenges may impact item level ratings or overall risk judgments in youth with complex neurocognitive and mental health disorders. Further, youth with FASD tend to have higher overall intellectual functioning compared to those with ID, suggesting a less than optimal fit between the two populations.

As the use of risk assessment tools with adolescent offenders is common (Viljoen et al., 2010), there is a high likelihood that evaluators are using the SAVRY and YLS/CMI in youth with FASD despite the lack of research examining their use in this population. Moreover, FASD is now included in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) as both an exemplar of "Other Specified Neurodevelopmental Disorder," and as a condition for further study (American Psychiatric Association, 2013), further underscoring the growing recognition and need for consideration of the condition by forensic clinicians. As such, it is critical to examine the validity of risk score interpretations using these tools in youth with FASD in order to both meet evidentiary admissibility criteria in North American courts (e.g., *R v. Mohan*, 1994; *R. v. Peters*, 2011; *Daubert v. Merrell Dow Pharmaceuticals*, 1993) and to ensure their use enhances rather than detracts from the accuracy of risk assessments. Recommendations concerning a young person's risk that are not empirically supported have the potential to be ineffective or even harmful, particularly in youth with complex clinical needs (Viljoen, Gray, & Barone, 2016). Inaccurate judgments of risk may result in serious restrictions on a young person's liberty, or, increased risk to the public in the event of underestimated or poorly managed risk. Thus, more research is required to understand whether use of the SAVRY or YLS/CMI in justice-involved youth with FASD is scientifically supported.

### The Present Study

In order to address an identified gap in the risk tool and FASD literatures, we completed the first study to prospectively evaluate the predictive validity of the SAVRY and YLS/CMI in justice-involved youth with FASD. We first characterized historical offending patterns between justice-involved youth with and without FASD. Our primary research question focused on evaluating whether SAVRY and YLS/CMI total scores, risk ratings, and structured professional risk judgments, could predict the onset of new charges during a one-year follow-up period. Given the high rates of commonly accepted risk factors reported in youth with FASD, we hypothesized that risk ratings and scores on both the SAVRY and YLS/CMI would be higher in justice-involved youth with FASD compared to those without FASD.

## Method

The information provided within the current study is reported in accordance with the Risk Assessment Guidelines for the Evaluation of Efficacy (RAGEE) Statement (Singh, Yang, Mulvey, & the RAGEE Group, 2015), a 50-item checklist designed to increase consistency in reporting across risk assessment studies that examine predictive validity.

### Participants

Participants included 50 justice-involved youth with FASD and 50 without FASD/PAE ($N$ = 100), ranging in age from 12 to 23 years ($M$ = 17.5, $SD$ = 1.59). Youth were recruited from two Canadian urban areas. Recruitment methods included referrals from justice-linked FASD diagnostic clinics and support agencies, probation and correctional officers, and lawyers, in addition to advertising via community flyers. Clinical reports were reviewed to confirm diagnosis in the FASD group, revealing that most were assessed by a multidisciplinary team, and diagnosed in accordance with nationally accepted diagnostic criteria and guidelines in the study

jurisdiction (Chudley et al., 2005). Under this approach, diagnostic outcomes under the FASD umbrella include Fetal Alcohol Syndrome (FAS) and Partial Fetal Alcohol Syndrome (pFAS), which are diagnosed when sentinel dysmorphic facial features, growth retardation, and neurodevelopmental impairment are present, and, Alcohol Related Neurodevelopmental Disorder (ARND), which is diagnosed when there is neurodevelopmental impairment in the absence of physical indicators.[1]

Participants in the comparison group were recruited from probation offices and correctional facilities located in the same geographic regions and screened for PAE using self-report and file review. Youth in the comparison group were intentionally recruited to mirror the number of youth with FASD enrolled while incarcerated versus in the community with the aim of minimizing the chance of between-group differences attributable to offending history.

From the 145 referrals received, 102 were enrolled (15 declined to participate, the remaining youth were considered ineligible or could not be contacted), and two youth withdrew before completing the protocol. We consider our participation rate (69%) to be comparable with similar prospective studies of adolescent risk (e.g., Green, Gesten, Greenwald, & Salcedo, 2008; Schubert et al., 2004).

Our youth participants included a subset of 52 emerging adults ranging in age from 18 to 23 years (i.e., 18 years [$n$ = 27], 19 years [$n$ = 16], 20 years [$n$ = 8], and 23 years [$n$ = 1]). Canada's juvenile justice legislation, the *Youth Criminal Justice Act* (YCJA), applies to youth between the ages of 12 to 17 years; however, its application frequently extends by several years, as youth charged before their 18$^{th}$ birthday are typically adjudicated and sentenced under the YCJA. The transition from the youth to adult justice systems in Canada is not clear-cut and youth may remain under the youth court and probation system for many years. In addition, youth with FASD are commonly described as being developmentally immature, often functioning at a level comparable with younger typically developing peers. Combined with the relative intractability of the neurocognitive deficits associated with PAE, it is important to explore the appropriateness of using risk assessment tools intended to be used with youth in young adults with FASD. While the SAVRY and YLS/CMI are designed for use with youth 18 years of age, given the potential impact of including youth 19 and older in the study, youth aged 12 to 18 years ($n$ = 75) were compared to youth aged 19 years and over ($n$ = 25) on a number of variables. The two age groups did not significantly differ with respect to YLS/CMI and SAVRY total scores, SAVRY protective factors score, SAVRY or YLS/CMI categorical risk ratings, adjudication status, age at first charge, age at first police contact, custody status, ethnicity, gender, highest grade, IQ, group status (i.e., FASD vs. comparison), or historical and prospective charges (i.e., dichotomous violent or any charges).

## Measures

**Criminal History and Recidivism**. Participants completed a semi-structured interview canvassing their criminal and personal histories (e.g., age at first police contact, education, employment, family history). Offending histories were abstracted from provincial justice files

[1] A more recent set of FASD Diagnostic Guidelines were published in Canada after the completion of this research, that use new diagnostic criteria and categories (Cook et al., 2015 ).

and databases (e.g., age at first charge, type and frequency of charges). *Recidivism* was defined as any new charge incurred after study enrolment, regardless of whether it resulted in a conviction. Consistent with most research on justice-involved youth, we opted to focus on new charges, not new convictions, because the processing time delays inherent in youth criminal justice prosecutions can be lengthy, with new ultimate dispositions not being issued for some time (e.g., years) following a charge (Schwalbe, 2008; Viljoen, Mordell, & Beneteau, 2012). *Violent charges* included those related to actual, attempted, or threatened harm to another individual, including sexual offenses. *Any charges* included all violent, non-violent, and administration of justice charges (e.g., breach of probation conditions).

**Wechsler Abbreviated Scale of Intelligence** (WASI; Wechsler, 1999)**.** The WASI is a brief, reliable, and valid measure that can be used to estimate intelligence in individuals age six through 89. The Full Scale IQ score was used in all analyses. In the current study, intraclass correlation coefficients (ICCs) were calculated in 25% of the sample for single raters using a two-way mixed effects model (Model 2; McGraw & Wong, 1996) and ranged from .81 (Vocabulary) to .99 (Similarities). ICCs are commonly classified in the following manner (Cicchetti & Sparrow, 1981; Shrout & Fleiss, 1979): poor ($\leq$ .40), fair (.40 to .59), good (.60 to.74), and excellent ($\geq$ .75).

**Structured Assessment of Violence Risk in Youth** (SAVRY; Borum et al., 2006) is a structured professional judgment (SPJ) tool designed to assist evaluators in assessing violence risk in adolescents across 24 risk factors for violence in three domains: *Historical Risk Factors*, *Social/Contextual Risk Factors*, and *Individual/Clinical Risk Factors.* The SAVRY also includes six protective factors in a single domain: *Protective Factors.* Risk factors are rated on a 3-point scale (Low, Moderate, and High) and protective factors are rated as Present or Absent. Raters make an overall rating of the risk for future violence (i.e., Summary Risk Rating [SRR]), taking into consideration item-level risk ratings, and any other factors deemed relevant (i.e., case-specific factors). In keeping with research practice, total scores were calculated for each of the three risk domains and the protective domain. A total risk score was calculated, ranging from 0 to 48, by summing the 24 risk factors. Numerous studies provide support for the predictive validity of the SAVRY in justice-involved youth (Olver et al., 2009; Singh et al., 2011). SAVRY ICC values for the overall sample were excellent, ranging from .87 to .98 across the three risk domains, total scores, and SRRs.

**Youth Level of Service/Case Management Inventory** (YLS/CMI; Hoge & Andrews, 2002). The YLS/CMI is an adjusted-actuarial tool developed to evaluate general recidivism risk in justice-involved youth, and to assist in case management planning. It incorporates 42 risk/need factors that are rated as present (1) or absent (0) across eight domains: *Prior and Current Offenses/Dispositions*, *Family Circumstances/Parenting*, *Education/Employment*, *Peer Relations*, *Substance Abuse*, *Leisure/Recreation*, *Personality/Behavior*, and *Attitudes/Orientation*. Based on total scores, youth are classified into four risk categories using an actuarial risk rating (ARR): Low (0-8), Moderate (9-22), High (23-34), and Very High (35-42). Raters can also override the ARR and make a professional risk rating (PRR) following the SPJ approach. The present study used the originally developed version of the YLS/CMI rather than the more recently released YLS/CMI 2.0 (Hoge & Andrews, 2011), as this was the version available at the time the current study was initiated. However, given that the YLS/CMI made only minor

changes to coding instructions, the correlation between the risk total scores for the two versions was found to be high ($r$ = .99, Gray, Viljoen, & Douglas, 2015). There is extensive research providing support for the predictive validity of the YLS/CMI in justice-involved youth (Olver et al., 2009, 2014). ICC values for the YLS/CMI in the current study (25% of the sample) were considered good to excellent, ranging from .79 to .99 across the eight domain scores, total score, ARR, and PRR.

## Procedure

Active consent was obtained from participants and/or legal guardians. Procedures adhered to ethical guidelines and approval was obtained from Simon Fraser University and the juvenile and adult Departments of Justice in both study jurisdictions. Participants completed a larger test battery comprising measures reported elsewhere (McLachlan, Roesch, Viljoen, & Douglas, 2014), including a structured interview canvassing demographic information and areas relevant to risk factors coded on the SAVRY and YLS/CMI. Files at community probation offices were reviewed, and risk tools were rated at baseline using all available information. Recidivism was coded using official data accessed through provincial databases by raters blind to baseline status.

*Study Personnel and Training.* Interviews, file reviews, and risk tool ratings were completed by the lead experimenter who was in a doctoral training program in psychology, a master's level research assistant, and a research assistant with a bachelor's degree in psychology. Prior to data collection, the research team attended a risk assessment training workshop offered by an expert in the field. To ensure reliable coding of the measures, each rater coded three mock files that were compared to gold-standard ratings.

## Data Analysis

Descriptive characteristics of the FASD and comparison groups are presented separately. Due to the non-normality of the data, between-group comparisons on descriptive characteristics and SAVRY and YLS/CMI scores were analyzed using Mann-Whitney $U$ tests and chi-square analyses with the sample estimate of Cliff's delta ($\hat{\delta}$; Cliff, 1993). The phi coefficient ($\phi$), or Cramer's V for variables with more than two categories, was calculated to reflect the magnitude of the differences between groups. Briefly, Cliff's delta represents the degree of overlap between the distributions of the FASD and comparison groups. Delta values range from -1 (i.e., scores in the comparison group are larger than the FASD group) to +1 (i.e., scores in the FASD group are larger than the comparison group), whereas a value of 0 is indicative of complete overlap between the two distributions (i.e., the distributions are identical; Romano, Kromrey, Coraggio, Skowronck, & Devine, 2006). Delta values of .15, .33, and .47 represent small, medium, and large effects, respectively (Romano et al., 2006).

Interrater reliability was calculated for 25 protocols dispersed throughout the study sample (i.e., 25% of the total sample). Each of these protocols was reviewed in detail by a second rater who provided scores and ratings on the WASI, SAVRY, and YLS/CMI. In calculating ICCs, a two-way mixed effects model was used for a single rater, absolute agreement (McGraw & Wong, 1996).

To examine historical and prospective (i.e., follow-up) charges, we coded for dichotomous (yes/no) charges in addition to the total number of charges incurred prior to and during the follow-up period (i.e., count data). To test for between-groups differences in the presence/absence of historical and prospective charges, we used penalized logistic regression given the relatively conservative sample size and resulting low cell count; thus reducing the risk of bias in estimating the odds ratio (Heinze, 2006). With respect to between-groups differences in the frequency of offending, negative binomial regression was used in place of Poisson regression given the presence of overdispersion in the data (Walters, 2007). Moreover, we examined between-group differences in time to incurring new charges at follow-up using Kaplan-Meier survival analysis.

To evaluate the predictive validity of the SAVRY and YLS/CMI, the area under the curve (AUC) of the receiver operating characteristic (ROC) was calculated (Hanley & McNeil, 1982; Mossman, 1994; Rice & Harris, 2005). AUC values reflect the probability that a randomly selected reoffender will have a higher score or risk rating on a risk assessment measure than a randomly selected non-reoffender. AUC values are thought to provide a measure of association that is robust against violations of normality and fluctuations in base rates of offending and range from 0 to 1, where .5 represents accuracy no better than chance and higher values reflect increased classification accuracy (Conroy & Murrie, 2007; Mossman, 1994; Rice & Harris, 1995). By convention, AUC values of .56, .64, and .71 correspond with small, medium, and large effect sizes, respectively (Rice & Harris, 2005). Between- and within-group comparisons of the calculated AUC values were achieved using unpaired and paired versions, respectively, of the DeLong, DeLong, and Clarke-Pearson (1988) test (see Robin et al., 2011). Moreover, Spearman's rank order correlation ($r_s$) was calculated to further examine the associations between reoffending outcomes and the SAVRY and YLS/CMI (i.e., $r_s$ for time-at-risk and number of charges).

Lastly, we examined the utility of the SAVRY and YLS/CMI in predicting time to incurring a new offense. However, given that the analyses were conducted for each group, we used penalized Cox regression to correct for the smaller sample sizes and resulting lower base rates for any new violent charge (Heinze & Schemper, 2001). Because reincarceration rates and time spent in custody were quite high during the follow-up period, we included time spent in custody as a covariate. Analyses were conducted using IBM Statistics 22 for Macintosh OS and R statistical software (R Core Team, 2014).

## Results

### Sample Characteristics

Sample characteristics and SAVRY and YLS/CMI total, subscale, and risk ratings are presented in Table 1. The groups did not significantly differ on adjudication status, age, age at first police contact, custody status, gender, or highest grade. Indigenous youth were overrepresented across the sample, a finding that is consistent with the literature on justice-involved youth in Canada (Porter & Calverley, 2011; Rudin, 2005). Youth in the FASD group recorded their first official charge approximately one year earlier than the comparison group, though the groups reported similar age at first police contact. IQ was significantly lower in youth with FASD relative to the comparison group, with 11 participants (9 FASD, 18.4%, and 2

comparison, 4%) scoring two standard deviations below the mean (e.g., IQ ≤ 70 or worse). Most youth in the FASD group were diagnosed with ARND, which typically does not present with clear physical features. Given the nature of our approach to recruiting youth for the comparison group, we assessed mean SAVRY and YLS/CMI scores relative to a sample of Canadian justice-involved youth drawn from a similar geographic location and time period (Viljoen et al., 2017). Scores among the comparison sample for both the SAVRY (*M* = 26.62, *SD* = 7.28) and YLS/CMI (*M* = 21.22, *SD* = 7.39) were similar to those reported by Viljoen and colleagues (2017) (SAVRY *M* = 25.92, *SD* = 8.47; YLS/CMI *M* = 19.43, *SD* = 7.47), suggesting that these youth provided a reasonable comparison group.

**Historical offending and custody experiences.** Participants in both groups incurred a high average number of charges prior to study enrolment (i.e., *M* = 40), though rates varied widely (see Table 2). Youth with FASD had a higher number of previous charges relative to youth in the comparison group. Nearly three-quarters of the sample spent at least one day in custody prior to baseline (*n* = 73), with an average of 75 days (*SD* = 132) spent incarcerated. Eleven participants (3 FASD and 8 comparison) were incarcerated for the entire follow-up period. These cases were removed for prospective analyses to focus on charges incurred while youth were in the community.

**Prospective offending.** Youth with FASD had a higher likelihood of reoffending during the follow-up period relative to comparison youth (base rate = 72.3% vs. 52.4%, respectively), with a significantly higher likelihood *and* number of violent offenses being observed in the FASD group (base rate = 46.8% vs. 26.2%, respectively) (Table 2). With respect to time-at-risk, results from the Kaplan-Meier survival analysis (Figure 1) indicated that the FASD group reoffended at a significantly faster rate than the comparison group ($M_{FASD}$ = 165.40 days [*SD* = 21.06] vs. $M_{Comp.}$ = 238.00 days [*SD* = 22.31], $\chi^2[1] = 5.15$, $p = .023$), including a significantly faster time to incur a violent charge ($M_{FASD}$ = 264.72 days [*SD* = 18.82] vs. $M_{Comp.}$ = 323.17 days [*SD* = 14.27], $\chi^2[1] = 4.66$, $p = .031$).

## SAVRY and YLS/CMI

**Total and domain scores and risk ratings**. Across most SAVRY and YLS/CMI domains, and on both instrument total scores, the FASD group had significantly higher scores relative to the comparison group. Youth with FASD also exhibited significantly lower scores on the SAVRY Protective Factors domain compared to non-FASD youth (Table 1). Significantly more youth with FASD were rated 'high risk' or 'very high risk' on the SAVRY and YLS/CMI relative to the comparison group. On the YLS/CMI, ratings on YLS/CMI ARRs reflected an *upgrade* from PRRs (e.g., from High to Very High) for 11 (22%) participants in the FASD group compared to only two participants (4%) in the comparison group.

**Predictive validity in the FASD group.** Results of the predictive validity analyses for the SAVRY and YLS/CMI are reported in Table 3.[i] Focusing on total scores and categorical risk ratings, results indicated that SAVRY total score AUCs for violent and any reoffending were moderate to large in magnitude (.65 and .70, respectively), as were the SAVRY SRRs (AUC = .60 and .70, respectively). This pattern was generally similar for the YLS/CMI total scores, ARR, and PRR for violent (.63, .61, and .69, respectively) and any reoffending (.66, .69, and .77,

respectively). Overall, with the exception of the SAVRY SRR for violent reoffending, categorical risk ratings were equal to or higher than total risk scores for both instruments, on both offending outcomes. Findings from paired AUC tests for within-group analyses revealed that when comparing the predictive accuracy of the SAVRY and YLS/CMI total scores, there were no significant differences between the tools for youth with FASD for neither violent ($z$ = -0.22, $p$ = .824) nor any reoffending ($z$ = -0.49, $p$ = .623).

**FASD vs. Comparison group.** Differences in the predictive accuracy for violent and any reoffending emerged when examining patterns in the FASD and comparison groups on the SAVRY and YLS/CMI. However, between-group analyses using the unpaired AUC test revealed that the predictive accuracy of the total scores did not differ significantly by group for violent (SAVRY: $z$ = -0.84, $p$ = .406; YLS/CMI: $z$ = 0.26, $p$ = .799) or any reoffending outcomes (SAVRY: $z$ = 0.21, $p$ = .837; YLS/CMI: $z$ = 0.05, $p$ = .957).

As reported in Table 4, penalized Cox proportional hazards analysis was performed to examine the predictive validity of the SAVRY and YLS/CMI while controlling for time spent in custody during the follow-up period. This included the SAVRY total scores, SRRs, and Protective Factors, and YLS/CMI total scores, ARRs, and PRRs. After controlling for time spent in custody, higher scores on many SAVRY and YLS/CMI risk indicators were significantly associated with increased rates of incurring any new charge in the FASD group; however, the YLS/CMI produced fewer significant predictions in the comparison group relative to the SAVRY. The Protective Factors domain of the SAVRY was inversely associated with time to reoffense, with the level of statistical significance varying across outcome and group. Apart from the SAVRY Protective Factors, no other predictors were significantly associated with time to violent reoffense across either group.

## Discussion

To our knowledge, this study is the first to evaluate the predictive validity of structured risk assessment tools designed for youth (i.e., the SAVRY and YLS/CMI) in a sample of justice-involved youth with FASD using a prospective design. Our findings provide novel and preliminary support for the utility of the SAVRY and YLS/CMI in estimating risk in this population, particularly for predicting general (i.e., any) reoffending. Overall, AUC values for the prediction of reoffending were varied and somewhat lower in magnitude across both groups relative to previous studies (see Olver et al., 2009; Viljoen et al., 2016). However, rater judgments of risk, or, those rendered by raters using a structured professional judgment approach using all available case information, emerged as the more robust predictors of recidivism (SAVRY SRR AUC = .70; YLS/CMI PRR AUC = .77, meeting commonly accepted standards for large effects (e.g., AUC = 0.71, Rice & Harris, 2005). One possible explanation for this finding is that raters may have taken individual case factors into consideration resulting in improved risk-related decisions, underscoring the potential importance of the SPJ approach in assessing the risks and needs of youth with complex clinical presentations. While both tools have been shown to predict general and violent recidivism in youth, further research is required to replicate and our findings before firm conclusions about either tool can be made in this population.

Our results suggest that neither the SAVRY nor the YLS/CMI predicted recidivism differently for the FASD and comparison groups at either the risk rating or risk total score level. However, most notably, the Protective Factors domain of the SAVRY showed the largest association with desistance from violent and overall recidivism in youth with FASD, even after controlling for time spent in custody, and was the most consistent predictor of absence of reoffending across analyses. Despite youth with FASD having fewer protective factors relative to youth in the comparison group (e.g., strong social support, strong commitment toward school, and resilient personality traits), the large association between the Protective Factors domain and desistance underscores the need to identify and bolster protective factors for this population. Our findings compliment an emerging literature emphasizing the key role of protective factors, resiliency, and strengths for offenders with FASD in the criminal justice system (Pei, Leung, Jampolsky, & Alsbury, 2016; Rogers, McLachlan, & Roesch, 2013), as well as research linking protective factors such as early assessment, diagnosis, and intervention with more positive outcomes (Streissguth et al., 2004).

As expected, we found that justice-involved youth with FASD were rated significantly higher across many SAVRY and YLS/CMI risk domains, total scores, and categorical risk ratings, relative to those without FASD. Most participants with FASD were rated at either high or very high risk to reoffend. In reviewing a number of studies comprising complex justice-involved youth (e.g., ID, substance use disorder diagnosis, dual diagnosis, comorbidity), we found that mean SAVRY total scores in the current study were substantially higher for youth with FASD relative to other samples (Gammelgård et al., 2008; Khanna et al., 2014; Viljoen et al., 2017), while mean total YLS/CMI scores were much above general justice-involved youth scores (e.g., Frize et al., 2008; Viljoen et al., 2017) but consistent with those reported for complex youth (e.g., Guebert & Olver, 2014; Khanna et al., 2014). Notably, Frize (2008) reported mean YLS/CMI scores in a sample of 112 justice-involved youth with ID (mean total score 19.38) which fell far below that obtained for the current FASD sample (26.88), suggesting the need to continue to understand which literatures can inform risk assessment and management approaches in this complex population.

Though not the focus of this study, these findings highlight the significant historical, contextual, and clinical needs observed in this sample of justice-involved youth with FASD. The question of whether a clinical characterization, such as having FASD, impacts a young person's trajectory through the criminal justice system is critical in informing future policy decisions about specialized service provision for offenders with FASD. Overall, our findings suggest that relative to other "high risk" justice-involved youth, those with FASD presented with exceptionally high-risk and complex profiles marked by significant lifetime adversity and clinical needs. It bears emphasizing that youth with FASD recidivated more rapidly during the follow-up period, perhaps illustrating the "revolving door" phenomenon in this sample. High recidivism rates in the FASD group suggest that risk management strategies may not have been effectively implemented to mitigate their risk. To our knowledge, this study represents one of the first empirical examinations in this area. Findings highlight the need for further study to best understand how to assess risk in this population and support positive outcomes in youth with FASD.

**Strengths and Limitations**

Unlike much of the research evaluating risk assessment tools, this study used a prospective design and incorporated information from both interviews and file review. These methodological strengths more closely approximate the clinical use of the SAVRY and YLS/CMI in day-to-day practice. Further, most studies on FASD in human populations use "typically developing" control groups, frequently resulting in concerns with respect to the confounding developmental contributions of PAE and environmental adversity (e.g., McLachlan et al., 2016). The current study is one of few to contrast youth with FASD against a sample of youth who have experienced similar types, if not degree, of developmental and environmental risk factors, in the absence of PAE. Nonetheless, findings should be considered in light of several limitations.

First, in keeping with research in other complex clinical populations, sample sizes in the current study were modest. It can be difficult to recruit justice-involved youth with FASD for several reasons, including limited diagnostic capacity, under recognition of the disorder, and the day-to-day hardships that complicate research participation for many youth and families. To our knowledge, this was one of the largest samples of justice-involved youth with FASD recruited prospectively for research, thus, we strongly encourage future research in this area, with more robust sample sizes, longer-follow-up periods, and consideration of the impact of using both charge and conviction outcomes for recidivism. Indeed, use of charge data in the current study could have resulted in an overestimate of recidivism using a one-year follow-up period. In addition to AUC analysis, we attempted to account for potential power limitations in the current study by adjusting our statistical approaches that are known to reduce the impact of small samples sizes and low base rates (e.g., penalized logistic and Cox regression). We also used nonparametric statistical analyses, which provide higher statistical power when data are non-normal (Gibbon & Chakraborti, 2011), and other statistical approaches that, despite not commonly being applied to risk assessment studies, are nevertheless more suitable for data analysis (e.g., negative binomial regression for count data; Walters, 2007).

Second, in an ideal study with this design, raters would be blinded to participant group. Unfortunately, this proved impractical as many participants with FASD displayed clinical signs during interviews, required extra support to attend appointments, and diagnosis-related information was often present in files. Further, it is unlikely that these tools would be used clinically without consideration of critical youth-specific factors, such as a diagnosis of FASD, and thus our results may more closely approximate practical application of both measures.

Lastly, finding that case-specific factors were likely being taken into consideration by raters (e.g., higher AUCs for PRRs on the YLS/CMI compared to total scores, coupled with the observation of raters' increasing their risk rating relative to total scores) similarly raises the question of whether specialized knowledge or training about FASD would be required to make most effective use the SAVRY or YLS/CMI in justice-involved youth. An important future research direction should focus on the assessment of field applications of the SAVRY and YLS/CMI in practice with youth who have FASD to assess potential need for additional training in relation to risk conceptualization and intervention planning in this population.

**Future Directions and Policy Implications**

Findings from this study are timely, given the recently heightened focus on addressing FASD in the criminal justice context through legislative and policy change (e.g., American Bar Association, 2012; Canadian Bar Association, 2013). For instance, Alaska passed legislation allowing FASD to be considered as a mitigating factor at sentencing (Senate Bill 151), while several similar, but unsuccessful Bills have been drafted in an effort to amendments to the Canadian *Criminal Code*. Findings from this study suggest that risk assessment tools such as the SAVRY and YLS/CMI may provide important information about a young person's risk to reoffend, and critically, potentially important information necessary for developing comprehensive management plans (albeit the latter remains to be tested empirically).

The issue of whether justice-involved youth with FASD require specialized services and assessment protocols, or whether current assessment and intervention models may be used to address their needs (e.g., using the SAVRY and YLS/CMI as published), remains complex and critical for policy decisions. Results from this study provide preliminary evidence for the continued use of already developed approaches to the evaluation of risk in justice-involved youth with FASD. However, further study is needed to understand whether FASD-specific training is required to ensure that risk tools, such as the SAVRY and YLS/CMI, result in effective risk evaluation and case management planning. Though, we expect that increased and accurate knowledge about FASD is likely to enhance forensic assessment, management, and intervention practices for justice-involved youth with this disorder. While tools such as the SAVRY and YLS/CMI may be used to augment the accuracy of judgments about a young person's risk, they are most appropriately used in the context of a thorough evaluation of each young person's treatment and management needs.

Critically, this study did not address whether justice-involved youth with FASD are equally *responsive* to management and intervention approaches designed to reduce risk and treat clinical needs. This question is arguably the most critical "next step" for researchers in this field. Risk assessments that are conducted for the sole purpose of making predictions about risk, without crafting risk-informed management and intervention plans, may result in many justice-involved youth with FASD being deemed high risk to reoffend. Failure to implement informed plans and supports may lead to poor response to "management as usual" and potentially higher rates of administration of justice charges, reoffending, incarceration, and ultimately, contribute to the "revolving door" problem in youth with FASD.

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Table 1. *Sample Characteristics and Mean SAVRY and YLS/CMI Total, Subscale and Risk Ratings by Group*

| | FASD | Comparison | | |
|---|---|---|---|---|
| | *n* (%) or *M (SD)* | *n* (%) or *M (SD)* | *U* or $\chi^2$ | $\hat{\delta}$ or $\phi$ |
| Adjudication status | | | | |
| Pre-adjudication | 27 (54.0%) | 24 (48.0%) | 0.36 | .06 |
| Post-adjudication | 23 (46.0%) | 26 (52.0%) | | |
| Age | 17.60 (1.84) | 17.46 (1.30) | 1221.00 | .02 |
| Age at first charge | 13.92 (1.68) | 14.94 (1.71) | 830.00** | -.34 |
| Age at first police contact[a] | 11.88 (2.24) | 12.47 (2.12) | 1041.50 | -.11 |
| Custody status | | | | |
| Community | 24 (48.0%) | 21 (42.0%) | 0.36 | .06 |
| Custody | 26 (52.0%) | 29 (58.0%) | | |
| Ethnicity | | | | |
| Aboriginal | 43 (86.0%) | 27 (54.0%) | | |
| Caucasian | 6 (12.0%) | 15 (30.0%) | 12.96** | .36 |
| Other | 1 (2.0%) | 8 (16.0%) | | |
| FASD diagnosis | | | | |
| FAS | 1 (2.0%) | - | | |
| pFAS | 5 (10.0%) | - | - | - |
| ARND | 44 (88.0%) | - | | |
| Gender (% male) | 40 (80.0%) | 41 (82.0%) | 0.07 | -.03 |
| Highest grade | 8.48 (1.66) | 8.84 (1.67) | 1143.50 | -.09 |
| IQ[b] | 79.43 (10.73) | 89.64 (11.28) | 627.00*** | -.49 |
| SAVRY | | | | |
| Historical | 15.24 (3.05) | 11.62 (3.59) | 557.50*** | .55 |
| Social/Contextual | 7.26 (2.19) | 6.74 (2.42) | 1068.00 | .15 |
| Individual/Clinical | 11.40 (2.70) | 8.76 (4.39) | 637.00*** | .49 |
| Protective | 0.96 (1.18) | 1.88 (1.48) | 774.00*** | -.38 |
| Risk total score | 33.40 (6.69) | 26.62 (7.28) | 614.50*** | .51 |
| SRR | | | | |
| Low | 3 (6.0%) | 4 (8.0%) | | |
| Moderate | 6 (12.0%) | 17 (34.0%) | 7.46* | .27 |
| High | 41 (82.0%) | 29 (58.0%) | | |
| YLS/CMI | | | | |
| Prior and Current Offenses/Dispositions | 4.20 (0.93) | 3.44 (1.68) | 982.50* | .21 |
| Family Circumstances/ Parenting | 3.22 (1.49) | 2.78 (1.54) | 997.50† | .20 |
| Education/Employment | 2.96 (2.36) | 2.32 (1.96) | 1068.50 | .15 |
| Peer Relations | 3.52 (0.91) | 3.16 (1.09) | 1024.00† | .18 |
| Substance Abuse | 3.74 (1.44) | 3.36 (1.45) | 1028.00 | .18 |
| Leisure/Recreation[c] | 1.98 (0.89) | 1.78 (1.05) | 1109.50 | .09 |
| Personality/Behavior | 4.62 (1.35) | 2.84 (1.83) | 546.50*** | .56 |
| Attitudes/Orientation | 2.70 (1.39) | 1.60 (1.41) | 725.50*** | .42 |
| Risk total score | 26.88 (6.20) | 21.22 (7.39) | 657.50*** | .47 |

| | | | | |
|---|---|---|---|---|
| ARR | | | | |
| Low | 0 (0.0%) | 4 (8.0%) | | |
| Moderate | 10 (20.0%) | 19 (38.0%) | | .31 |
| High | 37 (74.0%) | 26 (52.0%) | | |
| Very High | 3 (6.0%) | 1 (2.0%) | 9.71* | |
| PRR | | | | |
| Low | 4 (8.0%) | 4 (8.0%) | | |
| Moderate | 5 (10.0%) | 19 (38.0%) | 14.72** | .38 |
| High | 28 (56.0%) | 24 (48.0%) | | |
| Very High | 13 (26.0%) | 3 (6.0%) | | |

*Note*. $N = 100$; $U$ = Mann-Whitney $U$ test; $\chi^2$ = Pearson's chi-square test; $\hat{\delta}$ = Cliff's delta; $\phi$ = phi coefficient; FASD = Fetal Alcohol Spectrum Disorder; ARND = Alcohol Related Neurodevelopmental Disorder; FAS = Fetal Alcohol Syndrome; pFAS = partial Fetal Alcohol Syndrome; SAVRY = Structured Assessment of Violence Risk in Youth; SRR = Summary Risk Rating; YLS/CMI = Youth Level of Service/Case Management Inventory; ARR = Actuarial Risk Rating; PRR = Professional Risk Rating.

[a] Two cases removed from FASD group and one case removed from Comparison group due to missing data.

[b] One case removed from FASD group due to missing data.

[c] One case removed from Comparison group due to missing data.

[†] $p \leq .10$, * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$ (two-tailed test).

Table 2. *Historical and Prospective Offense Patterns by Group for Dichotomous and Count Outcomes*

| | FASD | Comparison | | |
|---|---|---|---|---|
| Dichotomous | *n* (%) | *n* (%) | OR | 95% CI |
| Historical (*n* = 100) | | | | |
| Violent | 44 (88.0) | 37 (74.0) | 2.46† | [0.90, 7.33] |
| Any | 50 (100.0) | 50 (100.0) | - | - |
| Prospective (*n* = 89) | | | | |
| Violent | 22 (46.8) | 11 (26.2) | 2.42* | [1.02, 5.98] |
| Any | 34 (72.3) | 22 (52.4) | 2.33* | [0.99, 5.65] |
| | FASD | Comparison | | |
| Count | *M* (*SD*) | *M* (*SD*) | IRR | 95% CI |
| Historical (*n* = 100) | | | | |
| Violent | 6.70 (6.12) | 5.40 (6.56) | 1.24 | [0.78, 1.96] |
| Any | 39.78 (30.69) | 28.42 (27.25) | 1.40* | [1.00, 1.96] |
| Prospective (*n* = 89) | | | | |
| Violent | 1.47 (2.05) | 0.45 (0.89) | 3.25** | [1.47, 7.26] |
| Any | 6.85 (7.57) | 4.69 (6.74) | 1.46 | [0.76, 2.79] |

*Note.* $N = 100$. OR = odds ratio for penalized logistic regression; IRR = incident rate ratio for negative binomial regression; CI = confidence interval.

† $p \leq .10$, * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$ (two-tailed test).

Table 3. *Predictive Validity Analyses for the SAVRY and YLS/CMI*

| | FASD ($n$ = 47) | | | | Comparison ($n$ = 42) | | | |
|---|---|---|---|---|---|---|---|---|
| | AUC | 95% CI | $r_s^{Time}$ | $r_s^{Charges}$ | AUC | 95% CI | $r_s^{Time}$ | $r_s^{Charges}$ |
| SAVRY | | | | | | | | |
| Violent charge | | | | | | | | |
| Risk total score | .65† | [.48, .81] | -.32* | .26† | .54 | [.36, .72] | -.05 | .06 |
| SRR | .60† | [.49, .71] | -.23 | .14 | .53 | [.36, .70] | -.03 | .01 |
| Protective[a] | .80*** | [.68, .92] | .52*** | -.48*** | .61 | [.44, .79] | .20 | -.20 |
| Any charge | | | | | | | | |
| Risk total score | .70* | [.53, .87] | -.48*** | .31* | .73** | [.56, .89] | -.47** | .31* |
| SRR | .70** | [.54, .85] | -.38** | .23 | .67* | [.52, .82] | -.36* | .34* |
| Protective[a] | .79*** | [.64, .93] | .35* | -.34* | .69* | [.53, .86] | .39** | -.38** |
| YLS/CMI | | | | | | | | |
| Violent charge | | | | | | | | |
| Risk total score | .63† | [.47, .79] | -.27† | .21 | .66† | [.49, .83] | -.27† | .19 |
| ARR | .61† | [.49, .73] | -.33* | .31* | .57 | [.39, .75] | -.16 | .09 |
| PRR | .69** | [.56, .82] | -.38** | .33* | .54 | [.34, .74] | -.04 | -.03 |
| Any charge | | | | | | | | |
| Risk total score | .66 | [.44, .87] | -.25† | .24 | .67† | [.49, .84] | -.28† | .33* |
| ARR | .69** | [.54, .83] | -.39** | .32* | .55 | [.38, .71] | -.04 | .15 |
| PRR | .77*** | [.65, .89] | -.53*** | .40** | .60 | [.44, .76] | -.20 | .24 |

*Note.* SAVRY = Structured Assessment of Violence Risk in Youth; SRR = Summary Risk Rating; YLS/CMI = Youth Level of Service/Case Management Inventory; ARR = Actuarial Risk Rating; PRR = Professional Risk Rating; AUC = area under the curve; CI = confidence interval; $r_s^{Time}$ = Spearman's rho correlation with time-at-risk; $r_s^{Charges}$ = Spearman's rho correlation with number of charges.

[a] For ease of interpretation, scores on the Protective Factors domain were reversed for the AUC analysis such that higher scores represent a deficit in protective factors.

† $p \leq .10$, * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$ (two-tailed test).

Table 4. *Penalized Cox Proportional Hazards Analysis of Any New Charges by Group Controlling for Time Spent in Custody*

| | FASD (*n* = 46) | | | | | Comparison (*n* = 42) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *B* | *SE* | $\chi^2$ | HR | 95% CI | *B* | *SE* | $\chi^2$ | HR | 95% CI |
| SAVRY | | | | | | | | | | |
| Violent charge | | | | | | | | | | |
| Risk total score | 0.06 | 0.04 | 2.39 | 1.06 | [0.99, 1.14] | 0.02 | 0.04 | 0.17 | 1.02 | [0.94, 1.10] |
| SRR | 0.58 | 0.56 | 1.43 | 1.79 | [0.74, 7.31] | 0.23 | 0.48 | 0.26 | 1.26 | [0.55, 3.45] |
| Protective | -0.93 | 0.31 | 13.94*** | 0.39 | [0.19, 0.68] | -0.31 | 0.24 | 1.91 | 0.74 | [0.45, 1.13] |
| Any charge | | | | | | | | | | |
| Risk total score | 0.08 | 0.03 | 6.70** | 1.08 | [1.02, 1.15] | 0.07 | 0.03 | 5.70* | 1.07 | [1.01, 1.13] |
| SRR | 0.98 | 0.48 | 6.40** | 2.65 | [1.21, 8.55] | 0.84 | 0.40 | 5.51* | 2.32 | [1.14, 5.43] |
| Protective | -0.47 | 0.19 | 7.95** | 0.62 | [0.42, 0.87] | -0.39 | 0.17 | 5.76* | 0.68 | [0.48, 0.93] |
| YLS/CMI | | | | | | | | | | |
| Violent charge | | | | | | | | | | |
| Risk total score | 0.08 | 0.05 | 3.15† | 1.08 | [0.99, 1.19] | 0.08 | 0.05 | 3.18† | 1.08 | [0.99, 1.21] |
| ARR | 0.89 | 0.49 | 3.32† | 2.43 | [0.94, 6.53] | 0.36 | 0.49 | 0.63 | 1.44 | [0.61, 4.05] |
| PRR | 0.61 | 0.33 | 3.68† | 1.84 | [0.99, 3.64] | 0.19 | 0.46 | 0.19 | 1.21 | [0.53, 3.18] |
| Any charge | | | | | | | | | | |
| Risk total score | 0.07 | 0.03 | 5.10* | 1.07 | [1.01, 1.15] | 0.07 | 0.03 | 4.56* | 1.07 | [1.01, 1.15] |
| ARR | 0.98 | 0.40 | 6.45** | 2.67 | [1.25, 5.84] | 0.16 | 0.32 | 0.26 | 1.17 | [0.65, 2.28] |
| PRR | 0.88 | 0.29 | 11.11*** | 2.40 | [1.41, 4.33] | 0.43 | 0.33 | 1.81 | 1.53 | [0.83, 3.02] |

*Note.* SAVRY = Structured Assessment of Violence Risk in Youth; SRR = Summary Risk Rating; YLS/CMI = Youth Level of Service/Case Management Inventory; ARR = Actuarial Risk Rating; PRR = Professional Risk Rating; *B* = regression coefficient; *SE* = standard error of *B*; HR = hazard ratio; CI = confidence interval.

† $p \leq .10$, * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$ (two-tailed test).

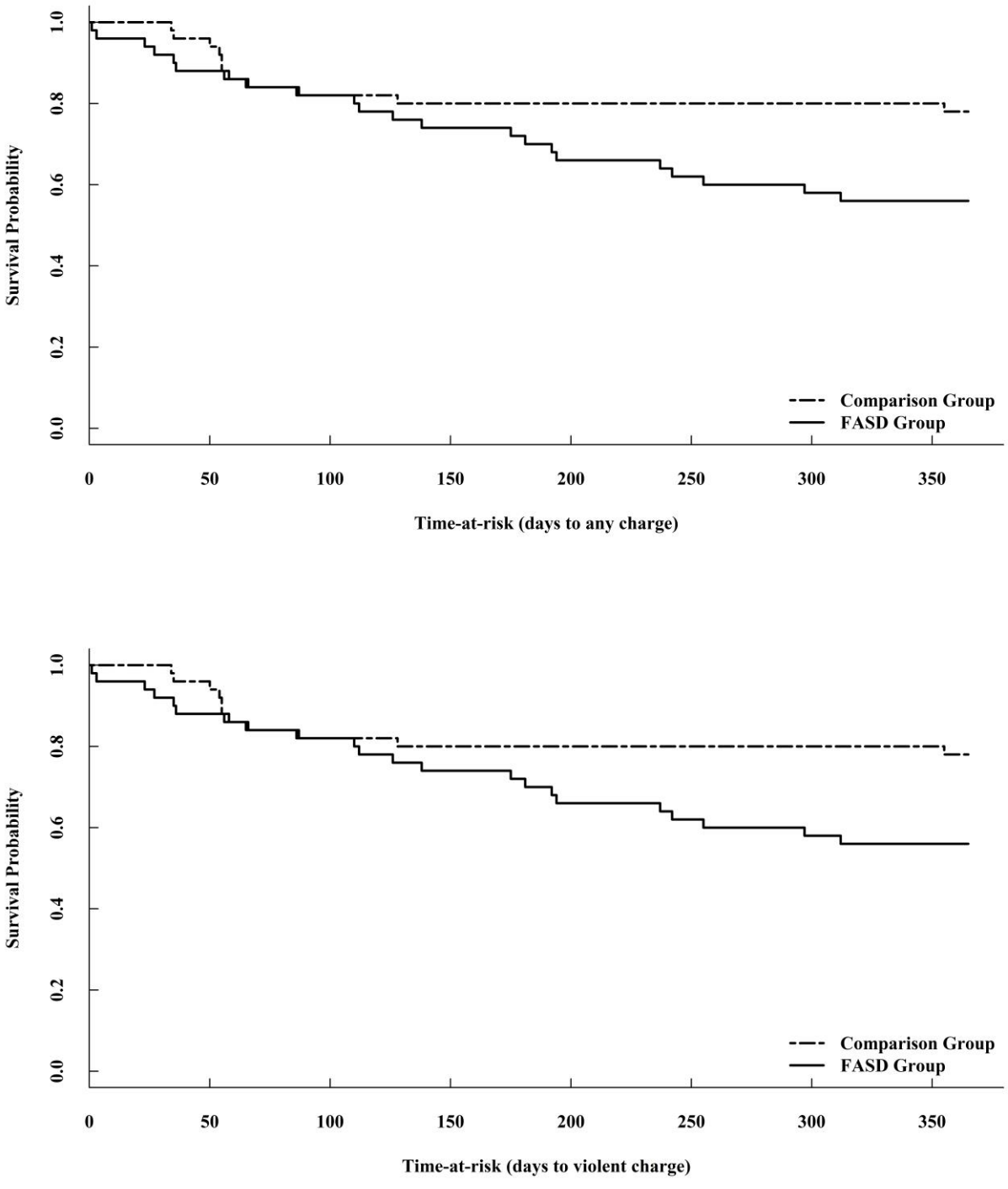


Figure 1. *Kaplan-Meier Survival Curves by Group for Any and Violent Prospective Charges*

Footnote

[1]AUC analyses were rerun using male ($n$ = 71) and adolescent only ($n$ = 68) samples to examine whether the inclusion of females and emerging adults impacted the results (see Appendix 1 in the online supplemental material). Though fluctuations in AUC values were evident, the general performance of the tools was similar to that reported within Table 3 with a small number of exceptions being observed (e.g., accuracy of the SAVRY SRR in predicting any and violent reoffending was found to be lower among FASD youth within the adolescent only sample).