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Predicting Recidivism in Sex Offenders Using the SVR-20: The Contribution of Age-at-release

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Sex offenders (N = 468) were released from custody and recidivism outcome was recorded. The Sexual Violence Risk-20 (SVR-20) was scored for each offender and the relationship between age-at-release and SVR-20 item and total scores was examined. SVR-20 total scores were not correlated with age-at-release (r = .-057). SVR-20 scores were combined with a score representing the age of the offender at their release from custody. On the basis of ROC analysis, predictive accuracy was significantly enhanced when age-at-release was included in the risk score. We suggest that the SVR-20, and perhaps other similar risk instruments, could be improved by including age-at-release information. We discuss the possibility that the advantage obtained by empirical actuarial instruments may be due in part to their close relation with age-at-release.

During the past 20 years, significant advances have been made in the assessment of the sex offender, particularly the development and promulgation of numerous assessment instruments that are demonstrably predictive of recidivism among adult male sexual offenders (Doren, 2002; Hanson & Morton-Bourgon, 2007). These have been developed using a variety of systematic approaches. Hanson and Morton-Bourgon (2007) distinguish among three extant approaches to the development of formal risk assessment instruments. These different approaches vary in (1) the way items are selected for inclusion in the instrument, and (2) the way item scores are combined to determine the final estimate of risk. In the *empirical actuarial* approach, the items are selected based on their empirical relationships with recidivism outcome and explicit rules are provided for combining the item scores into an overall evaluation of risk. In the *conceptual actuarial* approach, the items are rationally selected based on a theoretical understanding of sex offender recidivism, and explicit rules are provided for combining the item scores into an overall evaluation of risk. In the *structured professional judgment* approach, the items are rationally selected on the basis of a theory of risk but the final estimate is a subjective judgment made by the expert assessor (Hanson & Morton-Bourgon, 2007).

In the empirical actuarial approach, the items have no necessary face validity. They are selected and weighted based on their empirical relationship with recidivism outcome. In a recent meta-analysis of sex offender recidivism studies, Hanson and Morton-Bourgon (2004) identify the five most commonly used "empirical-actuarial" instruments as the Violence Risk Appraisal Guide (VRAG; Quinsey, Harris, Rice, & Cormier, 1998), the Sex Offender Risk Appraisal Guide (SORAG; Quinsey, et al., 1998), the Rapid Risk Assessment of Sexual Offense Recidivism (RRASOR: Hanson, 1997), the Static-99 (Hanson & Thornton, 1999), and the Minnesota Sex Offender Screening Tool-Revised (MnSOST-R; Epperson et al., 1998). Recently, Hanson and Morton-Bourgon (2007) conducted a meta-analysis of the accuracy of recidivism risk assessments for sexual offenders based on 577 findings from 79 distinct samples. Calculating the size of effects over these diverse studies, these authors concluded that empirical actuarial instruments were superior in their ability to predict recidivism in sex offenders

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compared with all other methods including conceptual actuarial measures and structured professional judgment. The current article suggests a plausible explanation for the superiority of the empirical actuarial instruments.

Recently, we (Barbaree, Langton, & Blanchard, 2007) examined the relationship between age-at-release and prediction of violent recidivism in sex offenders by two empirical actuarial instruments, the VRAG and SORAG. Our results indicated that, for the majority of items contained in the VRAG and SORAG (9 of the 12 and 14 items, respectively), lower risk scores were associated with older age-at-release. Moreover, for VRAG and SORAG bin scores, offenders with lower actuarial scores were released from custody at a significantly older age. If recidivism decreases with age-at-release, as a large body of recent literature has indicated (Barbaree, Blanchard, & Langton, 2003, 2003; Fazel, Sjöstedt, Långström, & Grann, 2006; Hanson, 2002, 2006; Prentky & Lee, 2007; Thornton, 2006), our findings with the VRAG and SORAG suggest that some part of their success in predicting recidivism may be due to the fact that these instruments identify older offenders as being at lower risk for recidivism (and younger offenders as being at higher risk).

To investigate the implications of this relationship for recidivism prediction, we regressed VRAG and SORAG scores on age-at-release and saved the residual scores as age-corrected actuarial scores. Then, we used ROC analysis to evaluate predictive accuracy comparing original VRAG and SORAG scores with their age-corrected counterparts. For those items that had been negatively correlated with age-at-release and for bin scores, the ability to predict recidivism was significantly reduced after the effects of age-at-release had been removed.

We suggested a possible explanation of this finding based on the statistical method used in the development of empirical actuarial instruments. As we indicated above, the empirical actuarial test developers selected and weighted their items based entirely on the items statistical relationship with recidivism among offenders in their instrument's developmental or standardization samples. The selection process did not consider the item's content, meaning, or theoretical significance. Therefore, if recidivism in sex offenders decreases with age-at-release, we should not be surprised that the VRAG and SORAG item responses have a statistical relationship with age-at-release. In other words, when the empirical selection methodology has selected items that bear a close relationship to recidivism outcome, and when age-at-release is correlated with recidivism, these three variables are all inter-correlated.

To test this hypothesis in the present study, we sought to conduct the same analysis as we did on the VRAG and SORAG on a conceptual actuarial instrument. In selecting items contained in conceptual actuarial instruments, test developers considered risk factors that had been shown previously to be related to recidivism in published research, and included items based on their theoretical significance to recidivism risk. Therefore, conceptual actuarial instrument items or total scores should not show the same negative correlation with age-at-release. If they do, it will not be due to the process of empirical selection of items.

The Sexual Violence Risk-20 (SVR-20; Boer, Hart, Kropp, & Webster, 1997) has been promoted by its developers as a structured professional judgment instrument for the assessment of sex offender risk. However, it is not uncommon for researchers to omit the professional judgment and simply add the item scores from the checklist, in which case the instrument becomes, effectively, a "conceptual actuarial" measure (Hanson & Morton-Bourgon, 2007). In the study, we utilized the SVR-20 as a conceptual actuarial measure, and conducted the same analyses using the SVR-20 scores as we conducted using the SORAG and VRAG scores reported in Barbaree et al. (2007). First, we examined the relationship between SVR-20 item and total scores and age-at-release. Second, we regressed item and total scores on age-at-release and saved the residual scores in the data base as age-corrected scores. Then, we compared the original SVR-20 item scores and total scores with their age-corrected scores in their ability to predict recidivism. Since the SVR-20 items had not been selected based on their relationship with outcome, we predicted that SVR-20 total scores would not be correlated with age-at-release and that the age-corrected scores would not be different from the original scores in their ability to predict recidivism.

We (Barbaree et al., 2007) also reported an unexpected and somewhat curious finding. As

described above, the majority of items on the VRAG and SORAG had a negative correlation with age-at-release. We did however find three items that showed a significant positive correlation with age-at-release. Examination of the content of these two item groupings seemed to suggest that items that reflected sexual deviance exhibited a positive correlation with age-at-release, while items that reflected antisocial behavior exhibited a negative correlation with age-at-release. In the present study, we continued our examination of this phenomenon.

Finally, we evaluated whether or not the addition of age-at-release information to the SVR-20 scores would improve the instrument's ability to predict recidivism. All of the empirical actuarial instruments listed above contain an item that codes offender age. Three of them code an offender as higher risk if they are below a criterion age at the time of their assessment (Static-99 & RRASOR, age 25; MnSOST-R, age 30). Two instruments (VRAG & SORAG) code age-at-index offence on a 5-level graded score. Interestingly, none of the commonly used conceptual actuarial or structured professional judgment instruments contain items that record any aspect of the offender's current age. For example, two of the commonly used conceptual actuarial measures developed in Vermont by McGrath and his associates (the Vermont Assessment of Sex Offender Risk (VASOR) and the Sex Offender Treatment Needs and Progress Scale) do not contain any item coding offender age (McGrath & Cumming, 2003; McGrath, Cumming, and Livingston, 2005; McGrath, Hoke, Livingston, & Cumming, 2001). The SVR-20 (Boer et al, 1997), the instrument we are using in this study and the most widely used structured clinical judgment instrument for the assessment of the sex offender does not contain any item that codes the age of the offender. As Harris and Rice (2007) have observed, neither the SVR-20 nor either of the other most widely used structured clinical judgment instruments used in the assessments of non-sex offenders (Spousal Assault Risk Assessment Guide (SARA), Kropp, Hart, Webster, & Eaves, 1995; the HCR-20, Webster, Douglas, Eaves, & Hart, 1997) incorporate current age of the offender. We predicted that, based on the accumulating evidence in support of age-at-release as a predictor of recidivism in sex offenders, the addition of age-at-release to the SVR-20 would improve the instrument's ability to predict recidivism.

METHOD

The current research was reviewed and approved by the Centre for Addiction and Mental Health Research Ethics Board (REB).

Participants

The sample comprised adult male sex offenders offered assessment and treatment at the Warkworth Sexual Behavior Clinic during its first eight years of operation (1989-1996). The clinic was located in Warkworth Penitentiary, a medium-security federal penitentiary in Ontario, Canada. Of the 806 offenders offered assessment and treatment, 571 participated in either assessment or treatment. All sexual offenders incarcerated at Warkworth Penitentiary were eligible for treatment at the WSBC and were encouraged to participate by their case managers. Offenders who did not consent to participation (N = 235) were not admitted to the program and were not included in this study. All 571 sexual offenders included in the study agreed to the use of their file information for research as part of their written consent to assessment and treatment at the WSBC. The sample included all sexual offenders seen at the WSBC who had relatively complete file information available. Ninety-five sexual offenders were excluded for various reasons (death, deportation, major inconsistencies in file information, offender not released by end of follow-up period). Data on recidivism outcomes were obtained for 476 sexual offenders who had been released to the community and therefore at risk to re-offend during the follow-up period.

The group of 476 sexual offenders was comprised of 175 rapists (offenders who had sexually assaulted females aged 16 years or older, exclusively), 155 child molesters (offenders who had sexually assaulted extra-familial children, aged 15 years or younger), 93 familial offenders (offenders who had sexually assaulted biologically related and/or step-children aged 15 years or younger, exclusively), 45 mixed offenders (offenders who had sexually assaulted females aged 18 years or older and children aged 13 years or younger, while being 5 or more years older than the child victim at the time of the abuse), 5 sexual offenders with adult male victims (offenders who had sexually assaulted a male

aged 18 years and older), and 3 offenders with non-contact sexual offences (e.g., a conviction for indecent exposure). Due to the lack of empirical evidence demonstrating the validity of the risk assessment instruments with non-contact sexual offenders or sexual offenders with adult male victims, these last two subsets (offenders with male victims 18 years or older and non-contact sexual offenders) were removed, leaving a final sample of 468 sexual offenders. This is the same sample of subjects we used to examine the relationships between age-at-release and the VRAG and SORAG (Barbaree et al., 2007).

DATA COLLECTION

Three sources of information were used to code data: archived clinical files generated by the Warkworth Sexual Behaviour Clinic (WSBC); the Offender Management System (OMS), a computerised national database containing correctional, psychological, and psychiatric reports on federally sentenced offenders maintained by the Correctional Service of Canada (CSC); and the Canadian Police Information Centre (CPIC) records, maintained by the Royal Canadian Mounted Police, detailing all criminal charges and convictions incurred in Canada.

Measures

A number of demographic and clinical variables were coded from the files. These data included basic identifying information; information on family, education, and employment history; and past and current offence information, and of course age-at-release from custody.

We scored the SVR-20 (Boer et al., 1997) on each of the participants. The SVR-20 is a structured professional judgment assessment instrument designed for use with individuals convicted or alleged to have committed a sexually violent offence. The SVR-20 is comprised of 20 items that have been shown in the literature to be empirically related or clinically relevant to recidivism in sex offenders. Evaluators use clinical judgment to rate each of the 20 items as either "not present" (score of 0), "possibly or partially present" (score of 1), or "present" (score of 2), using criteria provided in the manual (Boer et al., 1997). The 20 items are divided into three sections. The first is *Psychosocial Adjustment*. Items in this section require ratings on (1) sexual deviation; (2) childhood abuse; (3) psychopathy; (4) history of major mental illness; (5) history of substance use problems; (6) history of suicidal/homicidal ideation; (7) history of relationship problems; (8) history of employment problems; (9) history of non-sexual violent offences; (10) history of non-violent offences; and (11) history of supervision failures. The second section is *Sex Offences*. Items in this section require ratings on (12) the density of sexual offences; (13) variety of sexual offences; (14) physical harm to victims(s) in sexual offences; (15) uses weapons or threats of death in sexual offences; (16) escalation in frequency or severity of sexual offences; and (18) the degree to which attitudes are supportive/condone sexual offences. The third section is *Future Plans*. Items in this section require ratings of (19) the degree to which plans for the future are unrealistic; and (20) the degree to which attitudes toward intervention are negative. In the present research, total SVR-20 scores were calculated as the simple sum of all 20 item scores. The SVR-20 has recently been modified into a new instrument known as the Risk for Sexual Violence Protocol (RSVP; Hart et al., 2004). The RSVP was not available for our use when risk assessment coding was completed on our files prior to 2002.

A total of 2 coders were involved in scoring the SVR-20. Coders underwent rigorous training. Coding instructions were obtained from the manual for the SVR-20 (Boer et al., 1997). Coders were required to become familiar with these instructions. Coders were given a test file to code, and resulting scores compared with the scoring completed by the coding supervisor (author C.L.). Discrepancies between coder and supervisor were discussed and resolved. A second and third test file were coded and discussed in a similar way until discrepancies were minimized.

Inter-rater reliability of instrument scoring was calculated. The SVR-20 was independently scored by two coders using a randomly selected set of 63 participants from the sample. A Spearman rank correlation coefficient was calculated based on the two coder's total score for the instrument.

Recidivism information for the sample was obtained from the CPIC records up to December 13,

2001. Offenders were classified dichotomously according to whether or not they had a new conviction for a violent (including sexual) offence. To prevent any bias in the scoring of risk assessment instruments, all variables were coded blind to recidivism outcomes. The CPIC records were obtained after all other coding work had been completed. The average time-at-risk for the sample was 5.1 years. The time-at-risk reflects the time between release and the first instance of violent recidivism or the end of the follow-up period (December 13, 2001), subtracting any time during which the offender was returned to custody for parole violations or new offenses of another kind.

Data Analysis

All data analyses were conducted using the Statistical Package for the Social Sciences (SSPS) Version 12. The data analysis was conducted in four stages. First, we computed mean age-at-release for offenders obtaining each score value on each SVR-20 item. Then we computed ANOVA to compare mean age-at-release across score values for each item. Second, we calculated a simple correlation between SVR-20 total scores and age-at-release.

Third, for each item, and for the instrument's total score, a regression analysis was conducted regressing item and total scores on age-at-release. Following from these regression analyses, residual scores representing the difference between actual and age predicted score values were saved in the data file. These residual values represented an "age-corrected" version of the item or total score. In other words, these scores represented the conceptual actuarial scores with the effects of age-at-release removed. Finally, for each item and total score, a comparison was made between the original and the age-corrected version in terms of predictive accuracy.

Predictive accuracy was measured by the area under the curve (AUC) of the Receiver Operating Characteristic (ROC). ROC curves plot the sensitivity (hit rate or true positive probability) of a prediction as a function of specificity (false alarm rate = 1 minus specificity, or false positive probability; Hanley & McNeil, 1982; Swets, Dawes, & Monahan, 2000). Unlike other indices commonly used to evaluate the accuracy of recidivism predictions — such as correlations or percentage of recidivists and non-recidivists correctly classified — AUC values are relatively uninfluenced by base rates in the sample or selection ratios (Swets, 1986), and therefore represent the most appropriate index of accuracy for relatively low base rate events such as sexual re-offending (Rice & Harris, 1995). In recidivism research, the AUC value can be interpreted as the probability that a randomly selected individual in the sample who re-offends has a higher score on a given risk assessment instrument than a randomly selected individual who does not re-offend. AUC values range from 0 to 1; an AUC value of .5 represents prediction at chance level. Values higher or lower than .5 represent performances better or worse than chance, respectively. ROC analyses were carried out using SPSS version 12.

In similar research studies, direct comparisons between AUC values have been carried out using the method described by Harris et al. (2003), in which inferences about statistically significant differences between ROC areas are based on the 95% Confidence Intervals (CIs) derived from maximum-likelihood estimates of the ROC functions. Using this method, an ROC area outside the 95% CI for a second ROC area would be significantly different from the second ROC area at an alpha level of .05 in a two-tailed test. Such a methodology is appropriate when comparing AUC's calculated from different samples of subjects.

Finally, we conducted an analysis to evaluate the effect of "adding" age-at-release information to the SVR-20. We standardized both the SVR-20 scores and the age-at-release variable so that each distribution would have a mean of zero and a standard deviation of 1.00. Then, since older (higher) age-at-release is associated with lower risk, we reversed the standardized age variable by multiplying it by -1.00. Then we combined these two variables in various combinations varying the weight of the age variable (Combined Risk Score = $Z_{\text{SVR-20}} + C_{\text{Zage reversed}}$; with C varying between 0.1 to 1.5). Then, we subjected these derived risk scores to ROC analysis.

RESULTS

A detailed description of the sample demographic and offense history characteristics, and time-at-risk for violent recidivism outcome can be

found in Langton et al. (2007). Briefly, the sample consisted of offenders who (1) had committed their index offense at the age of approximately 31, (2) were approximately 40 years of age at release from custody, (3) had attained the educational level of grade 9-10, (4) most were not married (35% never married, 37% separated/divorced/widowed), (5) on average had committed 6 non-violent previous offenses, and approximately 1 violent previous offense. The sample of offenders was at risk in the community after their release from custody for an average of 5.1 years for violent recidivism.

Table 1 presents descriptive statistics for age-at-release comparing the various offender subgroups (i.e., rapists, extra-familial child molesters, incest offenders, and mixed offenders). Overall, there was a significant difference among the mean ages-at-release, $F(3,464) = 30.45$, $p < .001$. These groups were released on average in the following rank order from youngest to oldest: rapists, mixed offenders, non-familial child molesters, and incest offenders. Post-hoc multiple comparisons using the Tukey Test indicated that: (1) the rapists were released at a significantly younger age than any of the other groups, (2) the mixed offenders were released at a significantly younger age than the incest offenders.

Inter-rater reliability for the scoring of the SVR-20 was moderate-high, with our coding of the SVR-20 achieving a Spearman Rho of 0.75 . Coders were able to score the complete set of items in the SVR-20 for 99.5% of the sample.

Table 2 presents mean age-at-release (and standard deviations and Ns) for offender subgroups who received different scores on each SVR-20 item. We conducted ANOVA on each item, partitioning the 2 *df* mean square into its single *df* components (the linear component compared mean age-at-release of the group assigned a "0" with the group assigned a "2"; the quadratic component combined the mean age-at-release of the groups assigned scores of "0" and "2" and compared this with the mean age-at-release of the group assigned a score of "1". The quadratic trend can be thought of as a test of the deviation from linearity in the relationship between age-at-release and risk score. Since the Ns in the item score groupings were unequal but "planned" in the sense that they resulted from the proportions of these categories in the population of offenders, an analysis of weighted means (Keppel, 1982) was conducted (ANOVA) with the linear and quadratic trends computed separately.

Table 1
Descriptive statistics for age-at-release presented separately for rapists, extra-familial child molesters, incest offenders and mixed-age victim offenders.

				Range			
	N	*M*	*SD*	Minimum	Maximum	Median	Mode
Offender Subgroups							
Rapists	175	34.8	8.8	21	75	33	29
Extra-familial child molesters	155	43.1[a,b]	11.3	23	72	43	44
Incest offenders (Familial)	93	45.7[a]	9.6	26	70	44	41
Mixed-age victims	45	40.0[b]	11.1	27	83	39	39
Total Sample	468	40.2	11.0	21	83	39	44

Note: Means with common superscripts are not significantly different from one another at the 0.05 level of significance according to the Tukey Test controlling for experiment-wise error considering all pair-wise comparisons.

Table 2
Mean (and standard deviations) age-at-release for each item score value for each item in the SVR-20

SVR-20 Item #	SVR-20 Item		SVR-20 Item Score 0	1	2	*F(1,464)linear F(1,464)quadratic*
1	Sexual deviation	*M*	34.0	38.2	41.8	33.67***
		SD	9.6	8.0	11.1	
		N	72	48	347	
2	Victim of child abuse	*M*	40.8	40.9	39.8	<1.00
		SD	11.4	11.6	10.7	
		N	149	40	278	
3	Psychopathy	*M*	41.6	36.2	40.5	10.39**
		SD	11.5	8.1	11.1	10.79**
		N	326	113	27	
4	Major mental illness	*M*	40.1	38.0	44.4	1.82
		SD	11.2	8.4	11.1	6.48*
		N	369	59	39	
5	Substance abuse problems	*M*	43.9	40.9	39.1	15.06***
		SD	12.5	10.6	10.3	
		N	99	38	330	
6	Suicidal/homocidal ideation	*M*	41.4	38.0	39.3	4.34*
		SD	11.6	9.6	10.4	
		N	226	31	210	
7	Relationship problems	*M*	42.9	41.1	38.7	11.64**
		SD	11.8	10.9	10.5	
		N	100	116	251	
8	Employment problems	*M*	45.9	40.2	37.5	46.8***
		SD	11.6	10.3	10.0	
		N	111	129	227	
9	Past non-sexual violent offences	*M*	41.3	37.8	38.6	6.90*
		SD	11.3	16.9	10.1	
		N	286	3	178	
10	Past non-violent offences	*M*	44.1		38.6	25.29***
		SD	12.4		10.0	
		N	134		333	
11	Past supervision failure	*M*	43.4	39.6	37.4	36.48***
		SD	11.6	10.1	9.6	
		N	214	10	243	

...continued

Table 2 (continued)

SVR-20 Item #	SVR-20 Item		SVR-20 Item Score 0	1	2	*F(1,464)linear* *F(1,464)quadratic*
12	High density sex offences	*M*	34.4	37.8	44.9	128.39***
		SD	8.4	7.1	10.8	
		N	196	19	252	
13	Multiple sex offence types	*M*	39.3	40.8	41.9	6.04*
		SD	10.7	12.2	11.2	
		N	288	14	165	
14	Physical harm to victim(s)	*M*	41.0	38.7	37.58	7.28*
		SD	11.2	10.8	9.6	
		N	356	22	89	
15	Use of weapons or threats of death in sex offences	*M*	41.9	45.0	37.5	18.50***
		SD	11.6	17.2	9.0	
		N	275	8	184	
16	Escalation in frequency or severity of sex offences	*M*	35.8	44.0	43.2	53.16***
		SD	9.7	12.4	10.7	4.58*
		N	191	26	250	
17	Extreme minimization or denial of sex offences	*M*	37.6	39.9	44.0	28.93***
		SD	9.5	9.8	12.7	
		N	186	138	143	
18	Attitudes that support or condone sex offences	*M*	40.5	39.2	40.6	<1.00
		SD	10.4	10.7	11.9	
		N	195	124	148	
19	Lacks realistic plans	*M*	40.7	39.8	40.3	<1.00
		SD	10.5	11.2	11.5	
		N	167	196	104	
20	Negative attitude toward intervention	*M*	40.3	39.3	40.3	<1.00
		SD	10.5	10.7	12.5	
		N	316	55	96	

Note: *M* = arithmetic mean; *SD* = standard deviation. For items with only one *F* statistic reported, the *F* relates to the linear effect, the comparison between the group who scored "0" with those who scored "2". For items with two *F* statistics reported, the upper is the *F* relating to the linear effect, and the second is the *F* relating to the quadratic effect, comparing the group who scored "1" with the groups who scored "0" and "2" combined. Quadratic *F*s were not reported if they were not statistically significant. *$p < .05$; ** $p < <.01$; *** $p < <.001$

As indicated in Table 2, for 10 of the 20 items contained on the SVR-20, increased item score values representing higher risk were associated with significantly younger age-at-release. Offenders coded as higher risk on Psychopathy, F(1,463) = 10.39, $p < .01$, substance use problems, $F(1,464) = 15.06, p < .001$, suicidal/homicidal ideation, $F(1,464) = 4.34$, $p < .05$, relationship problems, $F(1,464) = 11.64$, $p < .01$, employment problems, $F(1,464) = 46.8$, $p < .001$, past non-sexual violent offences, $F(1,464) = 6.90, p < .05$), past non-violent offences, $F(1,464) = 25.29, p < .001$, past supervision failure, $F(1,464) = 36.48, p < .001$), physical harm to victims, $F(1.464) = 7.28$, $p < .05$, and use of weapons or threats of death, $F(1,464) = 18.50$, $p < .001$ were significantly younger at release than offenders coded as low risk.

For 5 of the 20 items contained on the SVR-20, increased item score values representing higher risk were associated with significantly older age-at-release. Offenders coded as higher risk on sexual deviation, F(1,464) = 33.67, $p < .001$, high density sex offences, $F(1,464) = 128.38, p < .001$), multiple sex offence types, $F(1,464) = 6.04$, $p < .05$), escalation in frequency of severity of sex offences, $F(1,464) = 53.16$, $p < .001$, and extreme minimization or denial of sex offences, $F(1,464) = 28.93, p < .001$, were significantly older at release than offenders scored as low risk.

For the item "major mental illness", a more complex relationship was observed. Offenders scored as a "1" were found to have been released at a significantly younger age than offenders scored as a "0" or "2", F(1,464) = 6.48, $p < .05$. For the remaining four items, no differences in age-at-release were observed among score groupings.

Given that half of the items contained on the SVR-20 exhibit negative correlations with age-at-release (the offenders who scored high were younger on release), we might expect that the correlation between SVR-20 total scores and age-at-release would be negative. However, the Pearson correlation we computed between these two variables was only r(466) = -.057, ns.

The next step in the data analyses focused on the differences in predictive accuracy between original actuarial items and their age-corrected counterparts. As indicated above, item and total SVR-20 scores were regressed on age-at-release and residual scores saved as age-corrected versions of the original item scores. Tables 3 and 4 present the results of ROC analyses comparing the original scoring of items and the age-corrected (residual) scoring. All of the SVR-20 items showed significant differences in predictive ability comparing their original with their age-corrected counterpart.

As we reported in our similar analysis of the VRAG and SORAG items (Barbaree et al., 2007) some items were impaired in their ability to predict recidivism when the effects of age-at-release were removed from the risk scores. Table 3 presents the items for which AUCs were significantly lower in age-corrected risk scores compared with the original SVR-20 items scores. As can be seen in Table 3, as with our similar analysis of the VRAG and SORAG items, these items seem to reflect aspects of antisocial behavior and violence. These results would suggest that some of the ability these items have in predicting recidivism is due to the item's relationship with age-at-release.

Table 4 presents items for which AUCs were significantly higher in age-corrected risk scores compared with the original SVR-20 items scores. As can be seen in Table 4, as with our similar analysis of the VRAG and SORAG items, these items seem to reflect aspects of sexual deviance. These results would suggest that the ability of these original SVR-20 items in predicting recidivism is impaired by their relationship with age-at-release.

Table 5 presents the AUCs for the original SVR-20 total scores and the age-corrected residuals of the total scores. As can be seen, while removing the effects of age-at-release from individual item scores has profound effects on individual items' ability to predict recidivism, removal of the effects of age-at-release from the SVR-20 total score has no appreciable effect on its ability to predict recidivism. The resulting AUCs for the original scores and their age-corrected counterparts are virtually identical. Figure 1 presents the ROC curves derived in this analysis. The two ROC curves overlap considerably indicating near equality in predictive ability.

Finally, we conducted an analysis to evaluate the effect of "adding" age-at-release information to the SVR-20. As mentioned earlier, the original SVR-20 does not include any item that mentions the age of the offender, and this distinguishes the SVR-20 from the empirical actuarial instruments which all

Table 3
AUC's (and 95% CI) predicting violent recidivism using original SVR-20 item scores and items scores after the effects of age-at-release have been removed. This table includes only items for which the age-correction reduced the item's predictive power.

SVR-20 Item #	SVR-20 Item	Original AUC	Original 95% CI	Age Corrected AUC	Age Corrected 95% CI
			Lower-Upper		Lower-Upper
2	Victim of child abuse	.56	(.50 - .62)	.48	(.42 - .54)
3	Psychopathy	.57	(.51 - .63)	.48	(.41 - .54)
5	Substance abuse problems	.63	(.57 - .68)	.52	(.47 - .58)
6	Suicidal/homocidal ideation	.52	(.46 - .58)	.44	(.38 - .50)
7	Relationship problems	.58	(.52 - .64)	.51	(.45 - .57)
8	Employment problems	.63	(.57 - .69)	.57	(.51 - .63)
9	Past non-sexual violent offences	.58	(.52 - .64)	.49	(.42 - .55)
10	Past non-violent offences	.59	(.53 - .65)	.50	(.44 - .56)
11	Past supervision failure	.64	(.59 - .70)	.57	(.52 - .63)
14	Physical harm to victim(s)	.52	(.46 - .58)	.40	(.34 - .47)
15	Use of weapons or threats of death in sex offences	.53	(.47 - .59)	.44	(.37 - .50)
19	Lacks realistic plans	.52	(.46 - .58)	.46	(.40 - .52)
20	Negative attitude toward intervention	.52	(.46 - .58)	.44	(.38 - .50)

Note: An AUC is statistically significant at the .05 level (two-tailed) when the lower bound of the 95% confidence interval is above 0.50. Such statistical significance would indicate that the item or scale is a significant predictor of recidivism. Two AUCs are significantly different from one another at the .05 level (two tailed) if each is outside the bounds of the 95% confidence interval of the other.

Table 4
AUC's (and 95% CI) predicting violent recidivism using original SVR-20 item scores and items scores after the effects of age-at-release have been removed. This table includes only items for which the age correction increased the item's predictive power.

SVR-20 Item #	SVR-20 Item	Original AUC	Original 95% CI	Age Corrected AUC	Age Corrected 95% CI
			Lower-Upper		Lower-Upper
1	Sexual deviation	.47	(.41 - .53)	.58	(.51 - .64)
4	Major mental illness	.50	(.44 - .56)	.62	(.57 - .68)
12	High density sex offences	.41	(.35 - .47)	.49	(.43 - .55)
13	Multiple sex offence types	.50	(.44 - .56)	.59	(.53 - .64)
16	Escalation in frequency or severity of sex offences	.48	(.42 - .54)	.56	(.50 - .63)
17	Extreme minimization or denial of sex offences	.49	(.43 - .55)	.55	(.49 - .61)
18	Attitudes that support or condone sex offences	.53	(.47 - .59)	.59	(.53 - .65)

Note: An AUC is statistically significant at the .05 level (two-tailed) when the lower bound of the 95% confidence interval is above 0.50. Such statistical significance would indicate that the item or scale is a significant predictor of recidivism. Two AUCs are significantly different from one another at the .05 level (two tailed) if each is outside the bounds of the 95% confidence interval of the other.

Table 5
AUC's (and 95% confidence intervals) predicting violent recidivism using original SVR-20 total scores compared with the same scores after the effect of age-at-release have been removed (residuals).

	Total Score	
	Original	Age Corrected
AUC	.63	.62
95% CI	(.57 -.69)	(.57-.67)
N	467	467

Note: An AUC is statistically significant at the .05 level (two-tailed) when the lower bound of the 95% confidence interval is above 0.50. Such statistical significance would indicate that the item or scale is a significant predictor of recidivism. Two AUCs are significantly different from one another at the .05 level (two tailed) if each is outside the bounds of the 95% confidence interval of the other.

Table 6
AUC's (and 95% CI) predicting violent recidivism using original SVR-20 total scores and scores derived as a combination of SVR-20 total standardized scores summed with age-at-release standardized and reversed. Different scores were derived by combining differently weighted age-at-release from 0.1 to 1.5.

	AUC	SE	95% CI Lower-Upper
SVR-20 Original Score	.63	.03	(.57 - .67)
Plus 0.1 age-at-release	.65	.03	(.59 - .70)
Plus 0.2 age-at-release	.66	.03	(.61 - .71)
Plus 0.3 age-at-release	.67	.03	(.62 - .72)
Plus 0.4 age-at-release	.68	.03	(.63 - .73)
Plus 0.5 age-at-release	.69	.03	(.64 - .74)
Plus 0.6 age-at-release	.70	.03	(.65 - .75)
Plus 0.7 age-at-release	.70	.03	(.65 - .75)
Plus 0.8 age-at-release	.71	.03	(.66 - .76)
Plus 0.9 age-at-release	.71	.03	(.66 - .76)
Plus 1.0 age-at-release	.71	.03	(.70 - .76)
Plus 1.1 age-at-release	.71	.03	(.66 - .76)
Plus 1.2 age-at-release	.71	.03	(.66 - .76)
Plus 1.3 age-at-release	.72	.03	(.66 - .77)
Plus 1.4 age-at-release	.71	.03	(.66 - .77)
Plus 1.5 age-at-release	.72	.03	(.67 - .77)

Note: An AUC is statistically significant at the .05 level (two-tailed) when the lower bound of the 95% confidence interval is above 0.50. Such statistical significance would indicate that the item or scale is a significant predictor of recidivism. Two AUCs are significantly different from one another at the .05 level (two tailed) if each is outside the bounds of the 95% confidence interval of the other.

Figure 1
ROC curves representing the prediction of violent recidivism in sex offenders. ROC analyses plot the sensitivity (or the true positive rate) as a function of specificity (false positive rate, or 1 minus specificity). One of the curves represents the prediction of recidivism using the total scores from the SVR-20 (the smoother of the two curves). SVR-20 scores were regressed over age-at-release and the residual scores saved in the data base as "age corrected" scores. The second curve represents the prediction of recidivism using the age-corrected scores. The AUCs derived from the ROC analyses do not indicate a significant difference between these two predictors (See Table 5).

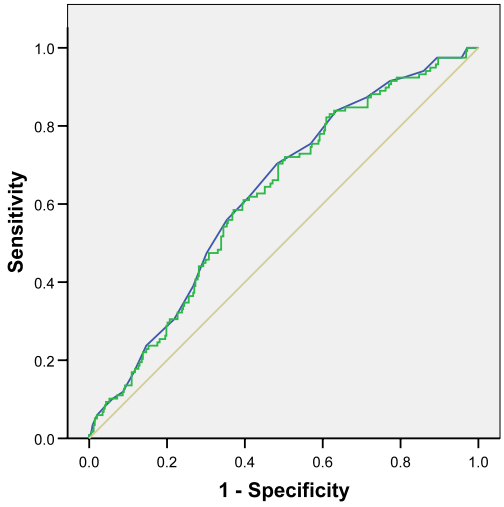
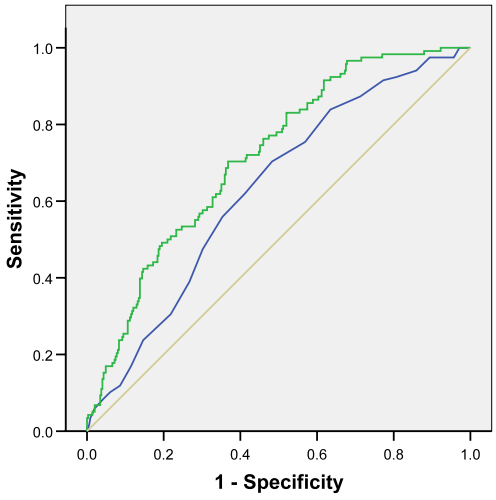


Figure 2
ROC curves representing the prediction of violent recidivism in sex offenders. ROC analyses plot the sensitivity (or the true positive rate) as a function of specificity (false positive rate, or 1 minus specificity). One of the curves represents the prediction of recidivism using the total scores from the SVR-20 (the smoother of the two curves) and represents an Area Under the Curve (AUC) of 0.63. The second curve represents a score that combines total SVR-20 scores (standardized) and age-at-release (standardized, reversed, and multiplied by 1.5). The second curve has an AUC of 0.72. (See Table 6).



contain an item coding age of the offender. The results are presented in Table 6.

As can be seen in Table 6, adding age-at-release in progressively increasing weights increases the AUC and the increase is statistically significant. The ROC curves for the original, Z_{SVR-20}, and the derived combined score, $Z_{SVR-20} + 1.5Z_{age}$ reversed are presented in Figure 2.

DISCUSSION

The present study has examined the relationship between age-at-release and scores on the SVR-20 utilized as a conceptual actuarial sex offender risk instrument. We set out to conduct the same analysis of the SVR-20 as we had previously conducted of the VRAG and SORAG as reported in Barbaree et al. (2007). Having completed the analysis, we found some similarities between the VRAG/SORAG and the SVR-20 and some differences. First, as with the VRAG and SORAG, a number of SVR-20 items were negatively correlated with age-at-release and a number of items were positively correlated. And second, as with the VRAG and SORAG, the items that were negatively correlated were related to antisocial behaviour and general violence, while the items that were positively correlated were related to sexual deviance. These observations may be explained with reference to different age distributions comparing rapists and child molesters in our sample. As reported for our current sample, rapists were released from custody at a younger age than both groups of child molesters and mixed offenders were released at a younger age than incest offenders. These age differences have been reported previously in numerous published articles (e.g., Dickey, Nussbaum, Chevolleau, & Davidson, 2002; Hanson, 2002). In most sex offender samples reported in the literature, the rapists are younger than the child molesters. As a consequence, risk factors prevalent in rapists and mixed offenders (e.g., antisocial behavior) would seem to be more prevalent in younger offenders, whereas risk factors more prevalent in child molesters (e.g., paraphilia) would seem to be more prevalent in older offenders. Therefore, when we compared offenders who had manifested a particular risk factor (antisociality, paraphilia) with offenders who lacked that factor, we found differences in mean age-at-release.

A third similarity between our analyses of the VRAG/SORAG and the SVR-20 was that, when we regressed item scores over age-at-release and saved the residuals as age-corrected risk scores, items that reflected antisocial behavior and general violence were reduced in predictive accuracy by the process of age-correction (see Table 3), and items that reflected aspects of sexual deviance were enhanced in predictive accuracy by the process of age-correction (see Table 4). Examination of the AUCs in Table 3 indicate that, after correcting for age-at-release, only 4 of 13 items are significant predictors of recidivism. In contrast, the AUCs in Table 4 indicate that, after correcting for the effects of age-at-release, 6 of 7 items are significant predictors of recidivism. These findings indicate, as we reported in Barbaree et al. (2007), age-at-release information is imbedded in the assessment instrument's items as they are currently used, and this age-related effect enhances items reflecting antisocial behavior and impairs items reflecting sexual deviance in their predictive power.

While our analysis found these similarities between the VRAG/SORAG and the SVR-20, we found numerous critically important differences. First, the ratio of items found to be negatively correlated with age-at-release to items positively correlated with age-at-release was higher with the VRAG/SORAG than the SVR-20. We (Barbaree et al., 2007) reported earlier that 9 of 12/14 items on the VRAG/SORAG respectively were negatively correlated with age-at-release, but only 1 and 2 items on the VRAG and SORAG, respectively, were positively correlated with age-at-release. In contrast, on the SVR-20, the ratio of negatively correlated items to positively correlated items was lower. We found 10 items to be negatively correlated and 5 items to be positively correlated with age-at-release on the SVR-20.

Second, while we had previously reported that VRAG and SORAG bin scores were negatively correlated with age-at-release (-.503 and -.362, respectively; Barbaree et al., 2007), we found in the present study that the total SVR-20 scores were not significantly correlated with age at release (-.057). It seems reasonable to suggest that the correlation between an instrument's total score and age-at-release is a product of the relative proportion of items with positive and negative correlations between the

instrument's individual item scores and age-at-release. We are suggesting that when the ratio of negatively to positively correlated items is high, the total score will be negatively correlated with age at release. When these two kinds of items are more evenly distributed in an instrument, the total score is more likely to be uncorrelated with age-at-release.

Third, while we had previously reported that the VRAG and SORAG bin scores were reduced in their ability to predict recidivism when subjected to the age-correction process, we have found in this study that the process of age correction has had no impact on the SVR-20's ability to predict recidivism. We had concluded in our previous study that this finding indicated that age-at-release information was imbedded in the VRAG/SORAG instruments and that the age-correction process had removed the age information from the risk scores. It would be appropriate to conclude with the current results that there is no age-at-release information imbedded in the SVR-20 total scores so that the age-correction process has no impact on the SVR-20's ability to predict recidivism. It seems reasonable to suggest that the ratio of antisocial to sexual deviance items contained in an instrument is critically important here. When an instrument contains a large majority of antisocial items, then age-correction will have the effect of reducing predictive ability. But, when these two kinds of items are more evenly distributed in an instrument, age correction has no effect on an instrument's predictive ability.

At present we can only speculate as to why these differences have obtained between the VRAG/SORAG and the SVR-20. In the introduction, we had described the differences between the empirical actuarial approaches and the conceptual actuarial approaches to the development of risk instruments. Following from Hanson and Morton-Bourgon (2007), we described the fundamental difference between these methods as the way in which the items contained in the instruments were selected. In the case of the conceptual actuarial instruments, the items were constructed and selected on the basis of a rational process based on a theoretical understanding of recidivism risk. In contrast, in the case of the empirical actuarial instruments, the items were selected on the basis of their empirical relationship with recidivism outcome. We speculated in our earlier paper (Barbaree et al., 2007), that this process of empirical selection and weighting of risk items has the effect of imbedding age-at-release information into the resulting actuarial instrument because the process favors the inclusion of items that are correlated with age-at-release. Based on our findings in both studies, we can now elaborate on our earlier speculation. The empirical process of selection of items correlated with recidivism outcome has the effect of selecting items that are negatively correlated with age-at-release. This is because of the now well-established relationship between age-at-release and recidivism; offenders who are older when they are released are less likely to re-offend. The empirical selection process has the effect of selecting items that are negatively correlated with age-at-release and to actively work against the selection of items that are positively correlated with age at release. In fact, the only such items to be selected by this empirical actuarial process and included in the VRAG and SORAG are very powerful predictors even before the age-correction process. The result is an instrument that is over-weighted with items that are negatively correlated with age at release, and total instrument scores that are negatively correlated with age at release. Age-at-release information is imbedded in the total scores of these instruments and contributes to their superior performance in predicting recidivism.

These findings as discussed so far indicate that, while individual items in the SVR-20 may contain age-at-release information, the SVR-20 total scores do not. SVR-20 total scores are not correlated with age-at-release and statistical procedures used to remove age-at-release information had no effect on the SVR-20 in predictive ability. And, as mentioned in the introduction, the SVR-20 does not contain any item that codes information about the offender's current age. Therefore, given the absence of age information in the SVR-20 and given that there is now considerable empirical support for aging as a risk factor in sex offenders (Barbaree et al., 2003; Fazel et al., 2006; Hanson, 2002, 2006; Prentky & Lee, 2007; Thornton, 2006) it is not surprising to find that the addition of age-at-release information to the SVR-20 scores significantly improved the instruments ability to predict recidivism. It is remarkable to note that, the addition of age-at-release information to the SVR-20 increased its AUC value in the prediction of violent recidivism to the same

level (.72) as we have found for the VRAG and SORAG in the same sample using the same recidivism data (.70 and .71 respectively; Langton et al., 2007). It is also likely that, for other actuarial instruments that have not performed to the standard of the VRAG/SORAG in the prediction of violent recidivism, such as the RRASOR and the Static-99, the addition of age-at-release information to these scores would significantly improve their ability to predict recidivism, perhaps to the performance standard set by the VRAG and SORAG.

We suggest on the basis of these findings that the apparent superiority of empirical actuarial instruments as described by Hanson and Morton-Bourgon (2007) is due to the artifactual and generally unrecognized correlation between these total scores and age-at-release, and to the fact that these instruments unintentionally capitalize on this spurious correlation in their prediction of recidivism.

Based on the findings reported here and in our earlier paper (Barbaree et al., 2007) we feel justified in making two general recommendations regarding the actuarial assessment of the sex offender. First, current forensic practice does not include adjustments in risk for recidivism in the older offender. Such adjustments or allowances must be incorporated into these assessments in order not to unfairly discriminate against the older sex offender. We consider this recommendation to be urgent. Wollert (2007) has suggested a methodology for making these age-related adjustments to risk assessments for older offenders. Second, conceptual actuarial and structured professional judgment instruments should incorporate the offender's current age into their assessment schemes. In relation to the assessment of the sex offender, this recommendation would apply to the SVR-20 and to the RSVP (Hart et al., 2003) which has been described as an updated version of the SVR-20 (Mercado & Ogloff, 2006). While our data most strongly suggest such an addition for instruments designed to assess sex offenders, we suggest that such an addition might be appropriate for instruments designed to assess violence risk in the non-sex offender as well. For example, the HCR-20 in the assessment of mentally disordered offenders (Webster et al., 1997) and the Spousal Assault Risk Assessment (SARA) in the assessment of spousal abusers (Kropp et al., 1995) might be improved by considering current age of the offender. Age-related reductions in violence risk in non-sex offenders are well recognized in the field (Hirschi & Gottfredson, 1983; Sampson & Laub, 2003) but are not currently incorporated in violence risk assessments.

With respect to specific advice to users of the SVR-20 who wish to incorporate current age into their assessments of sex offenders, we would recommend the following evaluation process. First, we feel that evaluators should have a detailed understanding of base rates for recidivism reported for different age groupings. We recommend that evaluators conduct careful inspection of the studies that have examined recidivism in sex offenders released at different ages (Barbaree et al., 2003; Fazel et al., 2006; Hanson, 2002, 2006; Prentky & Lee, 2007; Thornton, 2006). These studies show remarkable uniformity in the slope of the regression line representing reductions in rates of recidivism over age (Barbaree & Blanchard, 2008). And, except for the Prentky and Lee study, these studies show fair consistency in the rate of recidivism reported at similar age groups. See Barbaree and Blanchard (2008) for a representation of these study's results in a common easy to read format. Barbaree et al. (2003) report base rates of recidivism for sex offenders released at different ages (21-30, 31-40, 41-50, 51+) as 17%, 11%, 8% and 4% respectively. Second, we would recommend the use of the SVR-20 in its current form, used either as a Structured Professional Judgment or a Conceptual Actuarial assessment instrument, to establish the offender's ranking or relative position among sex offenders (high, moderate or low risk) at each of these age at release groupings. For example, the evaluator might find that the offender in question was high risk according to the SVR-20 but was age 52 at the time of his planned release. Despite the offender's SVR-20 scoring, this offender would be seen as being relatively low risk since the base rate for recidivism among offenders released at this age (4%) is a low base rate. In contrast, an offender found to be only moderate risk on the basis of the SVR-20 scoring, but released during his late 20's would be seen to be higher in risk because the base rate (17%) is relatively high. Used in this way, age at release information will improve the SVR-20 as a risk assessment instrument for use with sex offenders.

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