

Convergent, Discriminant and Predictive Validity of Two Instruments to Assess Recidivism Risk Among Released Individuals Who Have Sexually Offended: The SORAG and the VRAG-R

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Recidivism risk assessment has played an essential role in the criminal justice system for many years. Various risk assessment tools have been developed and recalibrated over the years for the purpose. Two such instruments, the Violence Risk Appraisal Guide (VRAG) and the Sex Offender Risk Appraisal Guide (SORAG), were both revised before being combined into the VRAG-R. The aim of our study was to evaluate the convergent, discriminant and predictive validity of the SORAG and the VRAG-R in a cohort of 294 released individuals who have sexually offended in French Belgium. Results suggest that the tools have good convergent validity and the ability to discriminate the risk level of individuals who have sexually offended with victims younger than 14 years old, whether intra- or extra-familial, from that of others at higher risk for re-offending. Where predictive validity is concerned, the scores on both instruments predict nonviolent nonsexual recidivism with a large effect size, and general recidivism (any type of recidivism) and violent nonsexual recidivism with a medium effect size. Sexual recidivism is not predicted at a statistically significant level by either the SORAG or the VRAG-R. Violent recidivism (sexual and non-sexual combined) is moderately predicted by the SORAG and the VRAG. However, these predictive qualities vary by the age of the victim. Certain combinations of items can be good predictors. In this regard, the VRAG-R items “failure on conditional release” and “marital status” together constitute a predictive model for general recidivism and sexual recidivism. The addition of the item “age at index offense” improves this model for general recidivism.

Keywords: VRAG-R, SORAG, predictive model, sex offences, recidivism, risk assessment

Use of Recidivism Risk Assessment Tools

The assessment of offender risk and, more particularly, of violence risk has played a key role in the criminal justice system for years. At the international level, 50% to 70% of clinicians use a recidivism risk assessment instrument during their evaluations (Singh et al., 2014; Viljoen et al., 2010). These instruments serve four purposes:

- identify key risk factors in individuals;
- estimate a risk level;

- help with risk management; and
- help with risk communication (Mills, 2017; Mills et al., 2011).

In French Belgium, risk assessment instruments are used in more than half of all evaluations (Pham et al., 2016). Some instruments are more widely used and deemed more useful than others. This use and perceived usefulness are primarily related to recidivism risk assessment rather than case management. Assessment practice has changed over the years and these instruments

are likely to be used in the framework of offender management and case management in the future. In the Belgian criminal justice system, although professionals are mandated to assess recidivism risk and make treatment referrals, there is no obligation to use an instrument to complete the task.

Different types of instruments were developed in the 1990s to predict recidivism risk in response to the limitations underscored by Monahan about the accuracy of the nonstructured clinical judgment of professionals in assessing risk in certain offenders. Indeed, expert opinion was only slightly better than chance when used to predict recidivism. This position echoed the earlier work of Monahan, which demonstrated the limits of clinical evaluations and prognoses, estimating their accuracy at no more than 33%. These instruments included static recidivism risk assessment instruments, such as the Violence Risk Appraisal Guide (VRAG) (Harris et al., 1993), the Sex Offender Risk Appraisal Guide (SORAG) (Quinsey et al., 1995), the Static-99 (Hanson & Thornton, 1999), and the Violence Risk Appraisal Guide–Revised (VRAG-R) (Harris et al., 2015b); structured clinical judgment instruments, such as the Historical Clinical Risk–20 Items (HCR-20) (Webster et al., 1997), the Sexual Violence Risk–20 Items (SVR-20) (Boer et al., 1997), and the Risk for Sexual Violence Protocol (RSVP) (Hart et al., 2003); and dynamic instruments, such as the Stable-2007 and the Acute-2007 (Hanson et al., 2007).

We undertook a study to specifically evaluate two static recidivism risk assessment instruments used with individuals who have sexually offended: the SORAG and the VRAG-R. The VRAG-R is an improvement on the SORAG. The creators of these instruments wanted to facilitate recidivism risk assessment by making a single instrument the (VRAG-R) instead of two distinct instruments (the VRAG or the SORAG) depending on the type of offender being evaluated. They also sought to optimize certain scoring criteria and remove or modify the items with the poorest validity or clarity of scoring. The only way to decide which of these instruments is best suited to one's purpose is by investigating their predictive validity.

Predictive Validity of the SORAG and the VRAG-R

Studies have shown the SORAG to have good predictive validity for general recidivism (GR) in correctional populations (Barbaree et al., 2001; Bartosh et al., 2003; Rettenberger & Eher, 2007). However, its predictive validity for sexual

recidivism (SR) has varied across studies from high (Rettenberger & Eher, 2007) to moderate (Barbaree et al., 2001; Bartosh et al., 2003; Olver & Sewall, 2018) to low (Quinsey et al., 1998). The SORAG's predictive validity has been found to be high (Barbaree et al., 2001; Rettenberger & Eher, 2007) or moderate (Bartosh et al., 2003; Olver & Sewall, 2018) for violent recidivism (VR).

Following a review of the literature, Bartosh et al. (2003) suggested that the SORAG's predictive validity varied by victims. The tool was significantly more predictive of SR, VR and GR among individuals who had extra-familial victims (area under the curve [AUC] ranging from .70 to .93) and related (incest) victims (AUC ranging from .72 to .91), compared with individuals who had other victim targets. For instance, among individuals with adult victims, it proved much less predictive (AUC ranging from .46 to .71). In the study by Rettenberger and Eher (2007), in the subgroup of individuals with adult victims, the SORAG proved significantly predictive of GR (AUC = .73). However, the results for SR were not statistically significant. Except for the results for non-violent non-sexual recidivism (NVNSR), the SORAG's predictive validity was adequate in the subgroup of extra-familial individuals who have sexually offended (AUC = .70). Rettenberger and Eher underscored that some results proved insignificant because recidivism rates were low, not through some fault with the evaluation tool.

The VRAG-R's predictive validity among individuals who had not reoffended (Rice et al., 2013; Olver & Sewall, 2018) for VR but weak for SR (Olver & Sewall, 2018). Regarding the predictive validity of individual VRAG-R items, "criminal non-violent history," "failure on condition release," "prior admissions to correctional institutions" and "antisociality" have been found to be good predictors of GR (Glover et al., 2017).

These instruments have proved good at predicting VR, which is congruent with their evaluation objectives.

Against this background, we undertook a study to evaluate the convergent, discriminant and predictive validity of the SORAG and of the VRAG-R among released individuals who had sexually offended in French Belgium. We also did a predictive analysis of the instruments' individual items to identify the ones with high predictive validity. Moreover, we sought to determine significantly predictive combinations of items. Our general aim was to identify the items most predictive of the different types of recidivism.

Table 1
Age of individuals who have sexually offended at time of release, years

Release type	<i>n</i>	<i>M (SD)</i>	Range
Parole	120	42.71 (10.70)	21.09–72.04
End of sentence	110	44.58 (11.68)	21.09–79.22
Provisional release	49	44.44 (11.49)	21.93–71.00
Other	10	32.68 (9.18)	18.29–45.50
Age of victims	<i>n</i>	<i>M (SD)</i>	Range
14 years and older only	64	40.23 (10.33)	21.09–60.85
Younger than 14 years only	176	44.72 (11.32)	21.93–72.01
Both age groups	48	43.53 (13.13)	18.29–79.22
Age of victims and offender-victim tie	<i>n</i>	<i>M (SD)</i>	Range
Younger than 14 years, extra-familial	36	40.87 (11.99)	21.93–69.75
Younger than 14 years, pseudo-incest	47	44.57 (11.63)	22.43–71.00
Younger than 14 years, incest	50	45.81 (10.54)	21.58–71.84
Younger than 14 years, incest and pseudo-incest	12	49.82 (7.46)	37.60–60.91
Younger than 14 years, intra- and extra-familial	30	45.34 (11.85)	21.69–72.01

Methodology

Participants

The cohort comprised 294 released individuals who had sexually offended and who received treatment or guidance from a specialized health team (SHT) in French Belgium in 2001 and 2002 or treatment from 2009 to 2016.

The participants were categorized based on criteria widely used in the international literature:

- Release type:
 - Expiry of sentence but at least one SHT consultation (37.93%)
 - Parole (PA) (41.38%; offenders sentenced to prison terms totalling more than three years)
 - Provisional release (PR) (16.90%; offenders sentenced by either the Department of Justice or the director of a correctional facility to prison terms totalling less than three years)
 - Other type of release, including prison leave, suspended sentence, and release from pretrial custody (3.79%)
- Age of victims:
 - Only 14 years and older (22.07%)
 - Only younger than 14 years (61.03%)
 - All ages (16.90%)
- Age of victims and offender-victim tie for victims younger than 14 years old:
 - Only 14 years and older (22.15%)

- Only younger than 14 years, pseudo-incest (e.g., uncle, grandfather, stepfather) (16.61%)
- Only younger than 14 years, incest (e.g., father) (17.30%)
- Only younger than 14 years, incest and pseudo-incest (4.15%)
- Only younger than 14 years, extra-familial (12.46%)
- Only younger than 14 years, intra-familial (incest, pseudo-incest or both) and extra-familial (10.38%)
- All ages (16.96%).

Mean age of the cohort was 43.47 years ($\sigma = 11.50$). Age at time of release ranged from 18.29 to 79.22 years.

The groups by release type differed significantly in terms of age at release ($F(3, 286) = 3.77, p = .01$). Individuals who were granted some other types of release were significantly younger than those released on parole ($p = .04$), released at the end of their sentence ($p = .01$), or granted provisional release ($p = .02$). When participants were categorized by age of victims, a significant difference emerged on age at release ($F(2, 285) = 3.62; p = .02$). Those with victims 14 years old and older were significantly younger than those with victims younger than 14 years old were ($p = .02$). Finally, when participants were categorized by age of victims and offender-victim tie (Table 1), they differed significantly according to age at release ($F(4, 170) = 2.36; p = .03$).

Table 2
Mean length of postrelease period, years

Release type	<i>n</i>	<i>M (SD)</i>	Range
Parole	120	9.85 (6.10)	.00–22.49
End of sentence	110	8.67 (4.75)	.19–17.84
Provisional release	49	10.18 (5.81)	.99–17.88
Other	10	5.00 (4.13)	1.08–13.70
Age of victims	<i>n</i>	<i>M (SD)</i>	Range
14 years and older	64	8.69 (6.05)	.00–22.49
Younger than 14 years	176	9.67 (5.46)	.10–18.48
Both age groups	48	8.57 (5.36)	.19–17.88
Age of victims and offender-victim tie	<i>n</i>	<i>M (SD)</i>	Range
Younger than 14 years, extra-familial	36	8.72 (5.61)	.10–18.07
Younger than 14 years, pseudo-incest	47	9.57 (5.76)	.54–18.36
Younger than 14 years, incest	50	10.48 (5.49)	.57–18.48
Younger than 14 years, incest and pseudo-incest	12	9.79 (5.38)	1.08–17.52
Younger than 14 years, intra- and extra-familial	30	9.79 (4.90)	.87–17.84

Participants had postrelease periods (period from release to recidivism or to research end date in the case of nonrecidivism) ranged from 0 to 22.49 years. Mean duration of postrelease period was 9.22 years ($SD = 5.59$). Mean duration of postrelease period did not differ significantly when participants were categorized by age of victims ($F(3, 285) = 1.19$; $p = .31$) or age of victims and offender-victim tie ($F(2, 285) = 0.77$; $p = .59$) (Table 2) but did differ when participants were categorized by type of release ($F(4, 170) = 3.32$, $p = .02$). Indeed, individuals who sexually offended who were granted some other type of release had a shorter release period than did those released on parole ($p = .05$) or granted provisional release ($p = .04$).

Instruments

Sex Offenders Risk Appraisal Guide

The SORAG is a scale for assessing VR, including of a sexual nature. It comprises 14 items that can be scored from information available in the offender's institutional file if it also contains diagnostic information. In addition to this type of information, it is necessary to also know the offender's score on Hare's Psychopathy Checklist (Hare, 1991) and the offender's phallometric test results. Total score can range from -26 to 51 and falls within one of nine risk categories (from lowest to highest) that determines the offender's recidivism risk over one or more periods of release.

Where its psychometric validity is concerned, various studies have shown the SORAG to have very high interrater reliability, with intraclass coefficients (ICC) of $.93$ to $.96$ and a Pearson's r correlation coefficient of $.94$ (Ducro & Pham, 2006; Rettenberger & Eher, 2007).

Violence Risk Appraisal Guide–Revised

The VRAG-R is a 12-item actuarial scale used to assess VR risk in violent offenders. It is derived essentially from the VRAG. Certain items were revised in the new version. For example, the item alcohol problems was replaced with alcohol or drug problems; the psychopathy item was replaced with antisociality; and the antisocial dimension is evaluated using tools measuring psychopathy. Also, the diagnostic criteria evaluated based on the DSM-III were removed. The 12 items yield a total score ranging from -32 to 40 . The range is divided into nine nonnominal risk categories.

Data about the VRAG-R instrument's psychometric and predictive validity are scant. Glover et al. (2017) reported an interrater coefficient of $.83$, and Rice et al. (2013) reported an ICC of $.99$ at the time of the instrument's creation.

Procedure

We examined the criminal records of our cohort to garner the information required to determine their recidivism risk level as measured by the SORAG and the VRAG-R, as well as date of release, date

of recidivism (if any), and type of recidivism (if any). Four types of recidivism were defined based on adjudicated criminal convictions:

- GR corresponded to any new conviction regardless of offence
- VR corresponded to any new conviction for a violent offence, whether sexual or non-sexual in nature:
 - SR corresponded to any new conviction for a sexual offence
 - VNSR corresponded to any new conviction for a violent nonsexual offence, such as non-sexual physical assault
- NVNSR corresponded to any new conviction for a non-violent non-sexual offence, such as theft.

The SORAG and the VRAG-R were scored by two research psychologists trained in their use after the interrater agreement was measured for each instrument on 75 cases. The two instruments presented very good interrater agreement: Pearson's r s were .88 for the SORAG total score and .89 for the VRAG-R total score and ICC were .87 for the former and .85 for the latter.

Data Analyses

Convergent validity was measured based on the correlations between the SORAG and the VRAG-R (Pearson's r).

The mean total scores for each instrument were compared (analysis of variance [ANOVA]) to measure their discriminant validity by offender categorization (e.g., by release type, by age of victims, and by offender-victim tie).

The instruments' predictive validity was evaluated by analyzing the AUC. It was estimated based on Cohen's d criteria (Rice & Harris, 2005) as large if the AUC was more than .714, medium if the AUC ranged from .639 to .714, and small if the AUC was less than .639. Furthermore, the predictive validity of the SORAG and the VRAG-R scores was compared by analyzing the difference between AUCs (z scores).

The predictive validity of each item of the SORAG and of the VRAG-R was evaluated by analyzing the AUC for the entire study population. Then, logistic regression analyses (Wald's forward stepwise method) were run to identify predictive models consisting of items from the two instruments predictive of the types of recidivism considered. Based on the values predicted by the models obtained, new AUCs were calculated to measure the predictive validity of these models. For all the data analyses conducted, statistical significance was set at .05.

Results

Convergent Validity

Regarding the convergent validity of the SORAG and the VRAG-R total scores, a correlation coefficient of .89 ($p < .001$) was obtained, indicating good convergence between the two instruments. However, the result was not surprising in that the instruments have seven items in common.

Discriminant Validity

No significant differences emerged from the analysis of the comparisons between the scores on the two instruments (Table 3) when participants were categorized by type of release.

However, when participants were categorized by age of victims, the scores varied significantly on the SORAG ($F(3, 286) = 16.69, p < .01$) and the VRAG-R ($F(3, 284) = 19.47, p < .01$). For both instruments, those with victims younger than 14 years old scored significantly lower than did those with victims 14 years old and older (both $p < .01$) and those with victims in each age group (both $p = .04$). The VRAG-R was found to discriminate those with victims in both age groups from those with victims 14 years old and older only, as the latter scored significantly lower on the instrument ($p = .03$).

When participants were categorized by age of victims and offender-victim tie, scores again varied significantly on the SORAG ($F(2, 287) = 7.57, p < .01$) and the VRAG-R ($F(2, 286) = 8.30, p < .01$). Individuals who had sexually offended victims 14 years old and older only scored significantly higher on both instruments than did those with victims younger than 14 years old with a pseudo-incestuous tie (both $p < .01$), an incestuous tie (both $p < .01$) or both intra- and extra-familial ties (respectively, $p = .05$ and $p < .01$). Moreover, regarding the SORAG scores only, participants with victims in both age groups were at higher risk of re-offending than were pseudo-incestuous participants with victims younger than 14 years old ($p = .01$).

Predictive Validity

The scores on both instruments predicted NVNSR with a large effect size, and GR and VNSR with a medium effect size. Neither the SORAG nor the VRAG-R significantly predicted SR (Table 4). However, VR (whether sexual or non-sexual) was moderately predicted by the SORAG and the VRAG.

When individuals who had sexually offended were categorized by release type, the instruments' predictive validity proved good for NVNSR and moderate for GR among those released at the end of their sentence or granted provisional release.

Table 3

Sex Offender Risk Appraisal Guide (SORAG) and the Violence Risk Appraisal Guide Revised (VRAG-R) scores by sex offender categorization (release type and victim type)

Table 3a**SORAG**

Release type	<i>n</i>	<i>M (SD)</i>	Range
Parole	120	.98 (9.15)	-16-22
End of sentence	110	1.71 (9.10)	-16-23
Provisional release	49	-.06 (9.61)	-14-22
Other	11	-3.09 (6.99)	-16-8
Age of victims	<i>n</i>	<i>M (SD)</i>	Range
14 years and older	64	5.91 (9.16)	-11-22
Younger than 14 years	177	-1.23 (8.38)	-16-23
Both age groups	49	2.31 (8.96)	-15-19
Age of victims and offender-victim tie	<i>n</i>	<i>M (SD)</i>	Range
Younger than 14 years, extra-familial	36	1.86 (10.06)	-12-23
Younger than 14 years, pseudo-incest	48	-3.83 (6.88)	-16-12
Younger than 14 years, incest	50	-2.20 (7.82)	-16-20
Younger than 14 years, incest and pseudo-incest	12	.00 (6.86)	-15-14
Younger than 14 years, intra- and extra-familial	30	.07 (8.74)	-13-20

Table 3b**VRAG-R**

Release type	<i>n</i>	<i>M (SD)</i>	Range
Parole	120	-6.38 (12.09)	-27-27
End of sentence	108	-5.09 (11.78)	-27-19
Provisional release	49	-6.94 (13.08)	-27-20
Other	11	-11.45 (9.19)	-21-11
Age of victims	<i>n</i>	<i>M (SD)</i>	Range
14 years and older	64	1.16 (12.68)	-23-27
Younger than 14 years	176	-9.08 (10.92)	-27-20
Both age groups	49	-4.55 (11.26)	-23-16
Age of victims and offender-victim tie	<i>n</i>	<i>M (SD)</i>	Range
Younger than 14 years, extra-familial	35	-4.63 (11.98)	-22-20
Younger than 14 years, pseudo-incest	48	-11.48 (10.25)	-27-14
Younger than 14 years, incest	50	-10.40 (10.18)	-24-17
Younger than 14 years, incest and pseudo-incest	12	-6.75 (11.78)	-27-15
Younger than 14 years, intra- and extra-familial	30	-9.83 (10.01)	-22-14

Table 4

Recidivism rates and predictive validity of the Sex Offender Risk Appraisal Guide (SORAG) and the Violence Risk Appraisal Guide Revised (VRAG-R) (follow-up M = 9.22 years)

Table 4a

General recidivism

Variable	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Total	25.85	.65** (.58-.72)	.67** (.60-.74)
Release type	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Parole	23.33	.61 (.49-.73)	.67 (.56-.78)
End of sentence	25.45	.69** (.56-.82)	.69** (.56-.81)
Provisional release	20.41	.68 (.49-.87)	.72** (.51-.92)
Other	63.64	.79 (.49-1.00)	.66 (.31-1.00)
Age of victims	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
14 years and older	25.00	.72** (.56-.88)	.72** (.58-.86)
Younger than 14 years	23.73	.64** (.55-.74)	.66** (.56-.76)
Both age groups	32.65	.64 (.47-.81)	.68** (.52-.84)
Age of victims and offender-victim tie	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Younger than 14 years, extra-familial	30.56	.63 (.41-.85)	.63 (.41-.84)
Younger than 14 years, pseudo-incest	18.75	.72* (.54-.90)	.75* (.56-.94)
Younger than 14 years, incest	20.00	.52 (.34-.70)	.60 (.43-.78)
Younger than 14 years, incest and pseudo-incest	16.67	.68 (.29-1.00)	.85 (.63-1.00)
Younger than 14 years, intra- and extra-familial	30.00	.62 (.39-.86)	.58 (.34-.83)

Table 4b

Violent recidivism

Variable	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Total	16.67	.60* (.52-.69)	.60* (.51-.69)
Release type	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Parole	14.17	.59 (.46-.73)	.65* (.52-.78)
End of sentence	17.27	.62 (.47-.78)	.62 (.46-.78)
Provisional release	12.24	.61 (.38-.84)	.61 (.36-.86)
Other	45.45	.53 (.16-.90)	.38 (.03-.74)
Age of victims	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
14 years and older	9.38	.76* (.56-.95)	.68 (.50-.86)
Younger than 14 years	16.95	.59 (.48-.72)	.60 (.49-.72)
Both age groups	22.45	.62 (.43-.82)	.65 (.46-.83)
Age of victims and offender-victim tie	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Younger than 14 years, extra-familial	27.78	.62 (.39-.85)	.62 (.39-.85)
Younger than 14 years, pseudo-incest	10.42	.48 (.30-.67)	.51 (.29-.73)
Younger than 14 years, incest	10.00	.54 (.37-.71)	.67 (.47-.88)
Younger than 14 years, incest and pseudo-incest	8.33	.41 (.11-.70)	.73 (.46-.99)
Younger than 14 years, intra- and extra-familial	26.66	.55 (.31-.79)	.51 (.26-.76)

Table 4c
Sexual recidivism

Variable	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Total	12.93	.56 (.46–.66)	.56 (.46–.66)
Release type	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Parole	9.17	.55 (.37–.72)	.60 (.44–.76)
End of sentence	14.55	.61 (.43–.79)	.59 (.41–.77)
Provisional release	10.20	.53 (.30–.77)	.58 (.29–.87)
Other	36.36	.36 (.01–.79)	.23 (.00–.53)
Age of victims	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
14 years and older	6.25	.89** (.80–.99)	.81* (.67–.95)
Younger than 14 years	14.43	.51 (.39–.64)	.52 (.38–.65)
Both age groups	20.41	.60 (.39–.81)	.64 (.45–.84)
Age of victims and offender-victim tie	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Younger than 14 years, extra-familial	19.44	.48 (.21–.75)	.47 (.20–.74)
Younger than 14 years, pseudo-incest	8.33	.46 (.26–.66)	.53 (.28–.79)
Younger than 14 years, incest	8.00	.54 (.35–.74)	.63 (.39–.87)
Younger than 14 years, incest and pseudo-incest	0.00	—	—
Younger than 14 years, intra- and extra-familial	23.33	.48 (.24–.73)	.46 (.20–.73)

Table 4d
Non-violent sexual recidivism

Variable	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Total	4.76	.65 (.53–.77)	.66* (.53–.78)
Release type	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Parole	5.83	.67 (.52–.82)	.69 (.53–.84)
End of sentence	4.55	.53 (.31–.75)	.58 (.32–.85)
Provisional release	2.04	.93 (.85–1.00)	.73 (.60–.86)
Other	9.09	1.00 (1.00–1.00)	.90 (.71–1.00)
Age of victims	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
14 years and older	3.13	.46 (.19–.72)	.41 (.29–.53)
Younger than 14 years	5.65	.71* (.56–.86)	.73* (.55–.90)
Both age groups	2.04	.72 (.59–.85)	.60 (.47–.74)
Age of victims and offender-victim tie	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Younger than 14 years, extra-familial	8.33	.85* (.73–.97)	.87* (.70–1.00)
Younger than 14 years, pseudo-incest	4.17	.66 (.50–.82)	.67 (.33–1.00)
Younger than 14 years, incest	2.00	.51 (.36–.66)	.81 (.70–.92)
Younger than 14 years, incest and pseudo-incest	8.33	.41 (.11–.70)	.73 (.46–.99)
Younger than 14 years, intra- and extra-familial	6.67	.56 (.09–1.00)	.40 (.00–.92)

Table 4e
Non-violent, non-sexual recidivism

Variable	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Total	11.90	.71** (.62–.80)	.75** (.67–.84)
Release type	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Parole	10.83	.61 (.44–.79)	.68* (.52–.84)
End of sentence	17.73	.76** (.65–.88)	.79** (.68–.89)
Provisional release	10.20	.79* (.56–1.00)	.81* (.57–1.00)
Other	18.18	.89 (.68–1.00)	.94 (.80–1.00)
Age of victims	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
14 years and older	17.19	.61 (.41–.82)	.67 (.50–.84)
Younger than 14 years	10.17	.77** (.66–.89)	.80** (.69–.91)
Both age groups	12.24	.67 (.43–.91)	.69 (.46–.91)
Age of victims and offender-victim tie	Rate, %	SORAG, AUC (ICC)	VRAG-R, AUC (ICC)
Younger than 14 years, extra-familial	11.11	.77 (.62–.92)	.82* (.64–.99)
Younger than 14 years, pseudo-incest	10.42	.92** (.83–1.00)	.99** (.96–1.00)
Younger than 14 years, incest	10.00	.50 (.22–.79)	.51 (.58–.74)
Younger than 14 years, incest and pseudo-incest	8.33	.91 (.74–1.00)	.91 (.74–1.00)
Younger than 14 years, intra- and extra-familial	6.67	.96* (.89–1.00)	.88 (.73–1.00)

Note. AUC = area under the curve; ICC = intra-class coefficients; — = not applicable

* $p \leq .05$; ** $p \leq .01$

For those released on parole, only NVNSR was moderately predicted by the VRAG-R. When participants were categorized by victim type, both instruments predicted GR and SR with a large effect size among those with victims 14 years old and older. Among participants with in both age groups, only the VRAG-R predicted GR and only moderately. Regarding those with victims younger than 14 years old:

- Although GR was moderately predicted by both instruments, it was largely predicted among pseudo-incestuous participants with victims under 14.
- VNSR was largely predicted by both instruments, particularly among extra-familial participants with victims under 14.
- NVNSR was also largely predicted by both instruments, particularly by the VRAG-R among those with extra-familial victims younger than 14 years old, and by both instruments among those with both intra- and extra-familial victims younger than 14 years old.

We only mention the statistically significant AUCs. Even though the VRAG-R yielded a larger number of significant AUCs, the z scores calculated to compare the differences between AUCs did not allow us to conclude that one instrument was a statistically better predictor than the other.

Regarding the predictive validity of individual items of the SORAG and the VRAG-R (Table 5), two SORAG items obtained significant low to moderate AUCs for the prediction of GR and NVNSR: “criminal history score for convictions or charges for non-violent offenses before index offense” and “failure on conditional release”. Furthermore, “age at index offense” proved a weak but nevertheless significant predictor of GR, and “criminal history score for convictions or charges for violent offenses before index offense” proved a moderate predictor of NVNSR.

Where the VRAG-R items are concerned, the two types of recidivism were similarly moderately predicted by items such as “failure on conditional release,” “age at index offense,” “criminal history score for convictions or charges for violent offenses before index offense” and “number of prior admissions to correctional institutions.” GR was predicted also by “marital status.”

“Marital status” under the VRAG-R proved a weak predictor of SR, and “age at index offense” under both instruments proved a moderate predictor of VNSR.

The logistic regression analyses (Table 6) yielded different models predictive of the different types of recidivism. GR was predicted by the combination of “failure on conditional release” and

Table 5

Predictive validity of the Sex Offender Risk Appraisal Guide (SORAG) and the Violence Risk Appraisal Guide Revised (VRAG-R) (follow-up M = 9.22 years)

Table 5a
SORAG

Variable	General recidivism, AUC (ICC)	Sexual recidivism, AUC (ICC)	Violent, non-sexual recidivism, AUC (ICC)	Non-violent, non-sexual recidivism, AUC (ICC)
Lived with both biological parents to age 16 years	.535 (.459-.610)	.477 (.379-.574)	.557 (.404-.711)	.546 (.444-.647)
Elementary school maladjustment	.523 (.445-.601)	.515 (.413-.617)	.492 (.336-.648)	.552 (.445-.658)
History of alcohol problems	.436 (.360-.513)	.446 (.344-.548)	.411 (.267-.554)	.456 (.354-.558)
Marital status	.539 (.461-.617)	.589 (.484-.694)	.606 (.437-.775)	.481 (.382-.581)
Criminal history score for convictions or charges for non-violent offences before index offence	.577* (.501-.654)	.474 (.373-.574)	.562 (.400-.725)	.659** (.564-.754)
Criminal history score for convictions or charges for violent offences before index offence	.570 (.495-.646)	.534 (.435-.632)	.558 (.403-.713)	.645** (.547-.744)
Number of convictions for previous sexual offences	.556 (.479-.634)	.579 (.476-.682)	.464 (.317-.611)	.563 (.457-.670)
History of sexual offences against girls younger than 14 years only	.561 (.488-.634)	.552 (.457-.646)	.432 (.273-.592)	.590 (.497-.682)
Failure on conditional release	.639** (.563-.715)	.583 (.481-.685)	.590 (.430-.749)	.665** (.563-.768)
Age at index offence	.614** (.536-.691)	.562 (.460-.664)	.713** (.570-.856)	.586 (.477-.694)
Meets DSM-III criteria of any personality disorder	.499 (.423-.575)	.498 (.400-.597)	.542 (.380-.705)	.490 (.388-.593)
Meets DSM-III criteria for schizophrenia	.509 (.434-.584)	.508 (.410-.605)	.507 (.354-.660)	.508 (.407-.609)

“age at index offense” under the SORAG and of these same items plus “marital status” under the VRAG-R. SR was predicted by the combination of “marital status” and “failure on conditional release” under both instruments. VNSR was predicted by “age at index offense” under the SORAG and by the combination of “failure on conditional release,” “age at index offense,” and “criminal history score for violent convictions or charges before index offense” under the VRAG-R. NVNSR was predicted by “criminal history score for non-violent offenses” and “failure on conditional release” under the SORAG and by “age at index offense” and “number of admissions to a correctional institution” under the VRAG-R. When we entered the values predicted by these models in our AUC analyses, we obtained AUCs with a high predictive value.

Discussion

The convergent validity of the instruments proved very high, which is consistent with the similarities between the two tools and with what has been reported in the international literature (Glover et al., 2017; Olver & Sewall, 2018).

Our examination of the discriminant validity of the tools identified profiles of individuals who had sexually offended at higher recidivism risk. These included those with victims 14 years old and older and those with victims in both age groups. We also observed that those who had incest and pseudo-incest offences presented a minimal VR risk as assessed by the two instruments. These results underscore the fact that the tools' predictive validity can be measured by the age of the victim.

Regarding the predictive validity of the instruments over a follow-up period of nearly 10 years,

Table 5b
VRAG-R

Variable	General recidivism, AUC (ICC)	Sexual recidivism, AUC (ICC)	Violent, non-sexual recidivism, AUC (ICC)	Non-violent, non-sexual recidivism, AUC (ICC)
Lived with both biological parents to age 16 years	.536 (.460-.612)	.497 (.398-.595)	.599 (.450-.749)	.542 (.438-.647)
Elementary school maladjustment	.541 (.462-.620)	.523 (.420-.627)	.485 (.329-.641)	.577 (.469-.684)
History of alcohol and drug problems	.523 (.445-.600)	.484 (.385-.582)	.506 (.347-.664)	.531 (.426-.636)
Marital status	.564 (.485-.643)	.599* (.494-.705)	.617 (.443-.791)	.515 (.410-.621)
Criminal history score for non-violent convictions or charges before index offence	.614** (.535-.693)	.501 (.393-.608)	.620 (.458-.782)	.706** (.608-.804)
Failure on conditional release	.615** (.537-.692)	.580 (.479-.682)	.591 (.431-.751)	.619* (.511-.727)
Age at index offence	.617** (.540-.694)	.547 (.443-.652)	.681* (.545-.818)	.622* (.516-.729)
Criminal history score for violent convictions or charges before index offence	.588* (.512-.665)	.546 (.446-.646)	.566 (.405-.727)	.664** (.564-.764)
Number of prior admissions to correctional institutions	.597* (.520-.673)	.522 (.420-.623)	.520 (.351-.689)	.695** (.598-.791)
Conduct disorder indicators	.532 (.455-.610)	.506 (.408-.605)	.539 (.363-.714)	.568 (.460-.676)
Sex offending	.527 (.452-.602)	.510 (.413-.607)	.298 (.189-.406)	.558 (.457-.659)

Note. AUC = area under the curve; ICC = intra-class coefficients
* $p \leq .05$; ** $p \leq .01$

the SORAG and the VRAG-R predicted NVNSR with a large effect size, and GR and VNSR with a medium effect size among all participants, particularly among those released at the end of their sentence or granted provisional release. These results are consistent with those reported in the literature regarding validation of the SORAG (Barbaree et al., 2001; Bartosh et al., 2003; Rettenberger & Eher, 2007), which has underscored a moderate to high predictive validity for GR, VR or both. However, release type was never documented in previous studies. We also observed moderate to high predictive validity for GR, VNSR and NVNSR among those with victims younger than 14 years old and, as a whole, among extra-familial offenders and among incest offenders. Similar results were reported in part by Bartosh et al. (2003) and by Rettenberger & Eher (2007) in their examinations

of the SORAG's predictive validity. When scores on the studied instruments were low, namely among those with victims under 14, the tools tended to be better predictors of GR, VNSR, and NVNSR.

Contrary to what has been reported in other studies (Barbaree et al., 2001; Lover & Sewall, 1998; Rettenberger & Eher, 2007), SR was not predicted in a statistically significant manner by neither the SORAG nor the VRAG-R. The recidivism risk of this population that most interests professionals is that for a new passage to the act of a sexual nature. In our study, where the SR rate was about 13%, both the SORAG and the VRAG-R demonstrated poor reliability in predicting SR risk. It need be reminded that the primary purpose of the SORAG is to assess VR risk in individuals who had sexually offended and that of the VRAG-R is to assess any type of recidivism in any type of offender. However,

Table 6
Predictive models and their predictive validity

Table 6a
Sex Offender Risk Appraisal Guide (SORAG)

Model	General recidivism	Sexual recidivism	Violent, non-sexual recidivism	Non-violent, non-sexual recidivism
Cox-Snell R2	.118	.056	.029	.080
Classification rate, %	75.2	86.2	94.7	87.8
Item	General recidivism	Sexual recidivism	Violent, non-sexual recidivism	Non-violent, non-sexual recidivism
Age at index offence, Wald (p) β	7.619 (.01) .160	—	6.438 (.01) .301	—
Failure on conditional release, Wald (p) β	19.032 (<.001) .479	3.190 (.07) .231	—	5.519 (.02) .347
Marital status, Wald (p) β	—	7.687 (.01) .380	—	—
Criminal history, Wald (p) β	—	—	—	3.992 (.05) .194
ROC	General recidivism	Sexual recidivism	Violent, non-sexual recidivism	Non-violent, non-sexual recidivism
AUC (ICC)	.698** (.626–.771)	.651** (.549–.752)	.713** (.570–.856)	.697** (.598–.797)

Table 6b
Violence Risk Appraisal Guide Revised (VRAG-R)

Model	General recidivism	Sexual recidivism	Violent, non-sexual recidivism	Non-violent, non-sexual recidivism
Cox-Snell R2	.109	.043	.056	.101
Classification rate, %	76.7	85.6	95.8	87.7
Item	General recidivism	Sexual recidivism	Violent, non-sexual recidivism	Non-violent, non-sexual recidivism
Age at index offence, Wald (p) β	5.066 (.024) .118	—	4.498 (.03) .268	6.515 (.01) .186
Failure on conditional release, Wald (p) β	15.495 (< .001) .217	4.197 (.041) .136	4.430 (.04) .242	—
Marital status, Wald (p) β	3.618 (.06) .334	6.611 (.01) .485	—	—
Prior admissions to correctional institutions, Wald (p) β	—	—	—	17.368 (<.001) .329
Sex offending, Wald (p) β	—	—	5.162 (.02) -.441	—
ROC	General recidivism	Sexual recidivism	Violent, non-sexual recidivism	Non-violent, non-sexual recidivism
AUC (ICC)	.698** (.627–.770)	.658** (.559–.757)	.803** (.689–.917)	.745** (.660–.831)

Note. AUC = area under the curve; ICC = intra-class coefficients; — = not reported

** $p \leq .01$

these instruments seem to predict SR only among participants with victims 14 years old and older, a finding also reported by Rettenberger & Eher (2007) and Olver & Sewall (2018), but not by Bartosh et al. (2003). This result makes sense when we consider that these tools are designed to assess VR risk. We observed that those with victims both age groups were at higher risk of recidivism, as was previously reported by Olver & Sewall (2018). We can hypothesize that these individuals have more in common with individuals with nonsexual or violent offences, namely, a higher recidivism risk owing to a lifestyle marked by a greater degree of instability and to greater antisociality. The mean scores on the SORAG and on the VRAG-R for those with victims 14 years old and older were significantly higher probably because they presented more priors and more antisocial characteristics, which is to say more characteristics taken into account by the two instruments under study.

When we chose to consider the entire population, we also chose to refine our predictive analysis by examining the predictive validity of each item of the instruments and to attempt to construct models from the most predictive ones. Based on these two techniques of analysis, we found that some items already identified in the literature, such as “prior non-violent offending,” “failure on conditional release” and “number of prior admissions to correctional institutions,” were predictive of GR (Glover et al., 2017). More precisely, the VRAG-R items “failure on conditional release” and “marital status” together constituted a predictive model for both GR and SR, and adding the item “age at index offense” improved the model for GR.

However preliminary, this type of analysis allows us to advance that this combination of items is more predictive of recidivism than other combinations are. This raises the question of the omission of certain items when conducting certain evaluations. Moreover, while these risk assessment instruments provide a total score or a category of recidivism risk, they can also allow a more refined analysis of an individual’s risk profile on an item-by-item basis. Indeed, complementing the total score with an item-by-item analysis would provide a better grasp of the individual’s risk profile. It seems essential, then, to refine our understanding of the assessment of an individual’s recidivism risk according to the items that constitute risk markers for that person. Even though the two studied tools are used in French Belgium more for the purpose of evaluation than of case management (Pham et al., 2016), it would be interesting during these evaluations to focus on

more than just the likelihood of re-offending. In fact, examining the risk factors present and absent in an individual would no doubt make it possible to take these evaluations into account when deciding how to manage the person within the criminal justice, health and social services, or both systems.

However, these results should be taken into consideration with caution. Despite the sufficiently large size of our sample, our item-by-item analyses were not conducted on categorized subgroups, for example, according to the age of the victim for fear of losing statistical power. It would be interesting to replicate this study with a larger cohort that includes forensic patients who had sexually offended and were discharged from secure psychiatric facilities, given that our study population was made up exclusively of those released from correctional settings.

The key takeaways from our study include:

- We can step back from the total score on these risk assessment instruments and focus our attention instead on the presence or absence of items that constitute risk markers.
- We must be careful about the omission of certain items that are more predictive than others and carry out specific analyses about the methods for calculating item omissions. Should omissions be weighted, or should they be imputed a score of 0? Complementary analyses of larger cohorts would make it possible to make the case for one or the other.
- We should perhaps approach the assessment of recidivism risk in this population from a different angle. Whereas it is common to focus on the potential recidivism risk of these individuals or on their SR rate (for the situation in Belgium, see Ducro et al., 2020; Menghini et al., 2005), as it happens, studies show that not all individuals who sexually offend will re-offend in a sexual manner and that items of a more general nature, such as marital status, failure on conditional release, and number of prior admissions to correctional institutions, are those that are most predictive. Consequently, if we wish to assess GR risk, the VRAG-R and the SORAG are well suited to the purpose. However, if evaluators wish to focus on a specific type of recidivism, such as SR, it would be more appropriate to use tools designed specifically for the purpose, such as the Static-99R among the actuarial tools available, or the SVR-20 and the RSVP among the existing structured clinical tools.
- Our study yielded the first ever results about the predictive validity of recidivism risk

assessment tools when individuals who have sexually offended are categorized by release type. This analysis demonstrated that those granted release of some other type presented a high recidivism rate though they did not present a higher risk than other offenders based on the instruments. However, as the size of this subgroup of participants was small, it is important to interpret these preliminary results with caution. Indeed, these participants had a lighter history of offending, were younger, and did not present a high risk, yet over a shorter follow-up period (mean length of five years), they do present a higher rate of re-offending.

Our study complements earlier ones of the validation of the SORAG conducted with individuals who have sexually offended and committed to secure forensic psychiatric facilities (Ducro & Pham, 2006). It would be useful to pursue these validation studies, especially where the VRAG-R is concerned, in secure psychiatric populations and to compare the predictive validity of these two instruments against not only that of other static risk assessment tools but also that of structured clinical risk assessment tools.

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