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Review article

Rates of violence in patients classified as high risk by structured risk assessment instruments

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Background
Rates of violence in persons identified as high risk by structured risk assessment instruments (SRAIs) are uncertain and frequently unreported by validation studies.

Aims
To analyse the variation in rates of violence in individuals identified as high risk by SRAIs.

Method
A systematic search of databases (1995–2011) was conducted for studies on nine widely used assessment tools. Where violence rates in high-risk groups were not published, these were requested from study authors. Rate information was extracted, and binomial logistic regression was used to study heterogeneity.

Results
Information was collected on 13 045 participants in 57 samples from 47 independent studies. Annualised rates of violence in individuals classified as high risk varied both across and within instruments. Rates were elevated when population rates of violence were higher, when a structured professional judgement instrument was used and when there was a lower proportion of men in a study.

Conclusions
After controlling for time at risk, the rate of violence in individuals classified as high risk by SRAIs shows substantial variation. In the absence of information on local base rates, assigning predetermined probabilities to future violence risk on the basis of a structured risk assessment is not supported by the current evidence base. This underscores the need for caution when such risk estimates are used to influence decisions related to individual liberty and public safety.

Declaration of interest
None.

Violence risk assessment is an increasing part of psychiatric practice. Psychiatrists, psychologists and other health professionals seeking to manage the risk of their patients acting violently have a range of structured risk assessment instruments (SRAIs) to assist them. These instruments score a patient on variables associated with violence. Such scores are then either combined mathematically (the 'actuarial' approach) or assist clinicians in making risk classifications (the 'structured professional judgement' approach). The most widely used instruments have satisfactory psychometric qualities in a range of settings and populations,[1] and are reported to provide more accurate predictions of violence than unstructured clinical assessments.[2]

Despite the widespread use of SRAIs by mental health practitioners in general and forensic settings,[3–6] the role of these instruments remains the subject of extensive debate.[3,7] Some of the controversy relates to the applicability of group-derived risk estimates to an individual case.[8] Studies of the predictive validity of SRAIs have shown that they can be used to rank individuals in terms of their likelihood of violence. At follow-up, for most groups studied, a randomly selected person who had engaged in violence will have scored more highly than a randomly selected person who had not in approximately 70% of cases.[9,10] This is a measure of SRAIs' ability to establish what has been referred to as the 'relative' risk for participants in a sample.[11]

In clinical practice, however, the absence of a comparison group puts a premium on establishing an individual's 'absolute' violence risk.[11] The actuarial approach to this task uses the violence rates of groups with a given score in past follow-up studies as an estimate of the likelihood that a future person with that score will act violently. In such schemes, individuals are assigned a numerical probability based on their score. The alternative, structured professional judgement (SPJ) approach allocates patients to one of several classes (e.g. high, moderate or low risk). Both approaches depend for their clinical usefulness on the rates of violence for people with similar scores or classifications being stable. Research suggests that this is not the case when SRAIs are used to predict sexual offending,[11–13] and it has been argued on theoretical grounds that it may not be the case for violent offending either.[14]

If violence rates in groups classified as high risk are unstable across study populations, there are a number of possible explanations. Several authors have suggested that for statistical reasons the rate of violence among high-risk cases should rise as the rate of violence rises in the population as a whole.[13,14] This explanation seems to preclude any numerical probability from being reliably assigned to an individual's violence risk without reference to local base rates. It is also possible that the clinical discretion granted to SPJ users, but not to clinicians employing actuarial approaches, leads them to classify different groups of individuals as high risk. Further variation may result from features of the design of the study, such as follow-up in a hospital rather than in the community, or reliance on criminal conviction as opposed to self-reported violence as an outcome.[15] The prevalence of known risk factors for violence, such as age and gender, will also vary from one study to another. Finally, differences between countries and legal systems may lead to preventive measures, such as effective treatment and supervision, being more widely used.

Despite the increasing use of SRAIs, the rates of violence in groups classified as high risk by these instruments have not been systematically described, nor have the sources of any variability been studied. We examined data from predictive validity studies of the most widely used instruments to investigate the extent and sources of variation in rates of violence by individuals judged to be high risk. Specifically, we examined the degree to which variation in rates of violence in high-risk groups was explained by:

(a) the rate of violence in individuals not classified as high risk;

(b) the type of instrument administered;

(c) methodological differences;

(d) sample characteristics;
(e) geographic location.

We focused on rates of violent behaviour in high-risk patients, as these are the individuals for whom clinicians are most likely to consider additional treatment, in-patient stay or supervision for the purposes of risk reduction.

Method

Risk assessment instruments

The nine risk assessment instruments most commonly used in clinical practice according to a recent international survey were included,[6] five of which were actuarial and four of which employed the SPJ approach. Actuarial instruments comprised the Level of Service Inventory – Revised (LSI-R),[16] the Psychopathy Checklist – Revised (PCL-R),[17] the Sex Offender Risk Appraisal Guide (SORAG),[18] the Static-99,[19] and the Violence Risk Appraisal Guide (VRAG).[18] The SPJ instruments comprised the Historical, Clinical, Risk Management – 20 (HCR-20),[20] the Sexual Violence Risk – 20 (SVR-20),[21] the Spousal Assault Risk Assessment (SARA) and the Structured Assessment of Violence Risk in Youth (SAVRY).[22,23]

Systematic search

A systematic search was conducted to identify studies that measured the predictive validity of the nine instruments (Fig. 1). PsycINFO, EMBASE, Medline and the US National Criminal Justice Reference Service Abstracts were searched between 1 January 1995 and 1 January 2011 using the acronyms and full names of the instruments as keywords. This search was supplemented with studies identified through references, annotated bibliographies and correspondence with risk assessment experts. Investigations from any country in any language were considered for inclusion. Unpublished studies (government reports, conference presentations, Master's theses and doctoral dissertations) were also considered. Actuarial instruments' development studies were excluded, as were studies that used only select scales of an instrument and retrospective studies where risk assessment instrument coders were not masked to outcome.

To be included in the study, the rate of violence for participants classed as high risk (standardised according to the most recent version of the instruments' manuals) and information on time at risk must have been available either in the published article or from the authors. In studies where several instruments were administered, rate data were included for each instrument and counted separately. When studies used samples composed of the same participants, the study with the largest sample size was included.

The initial search for predictive validity studies identified 468 investigations relating to the nine instruments. The rate of violence in individuals judged to be at high risk according to instruments' manuals and time at risk information was available in the manuscripts of 21 eligible studies. Information from the remaining studies was requested directly from study authors and obtained for 26 studies. As none of these studies reported the rate of violence in individuals administered the LSI-R and judged to be at high risk, that instrument was excluded from further analysis. Details of the included studies can be found in online Table DS1.

Data extraction

One author (J.P.S.) extracted rate information, study features and sample characteristics from the validity studies using a standardised coding sheet. As a measure of quality control, six (12.8%) of the included articles were randomly selected and coded by another author (A.B.). A high level of interrater agreement was established ($\kappa = 0.95$).[24]

Statistical analysis

Descriptive statistics were calculated for the mean rate of violence in individuals classed as high risk both for each instrument and overall for all instruments combined. Rates of violence in the high-risk group were defined as the ratios of the number of offending individuals in the high-risk group to the total number of individuals classified as high risk. Annualised rates were defined as violence rate divided by length of follow-up and capped at 100%. Variability in rates was measured using the I^2 index, calculated based on χ^2 differences between individual sample rates and the overall rate weighted by inverse variances. The I^2 index describes the percentage of variation across samples due to between-study variability rather than sampling error alone.

Univariate binomial logistic regression analyses were then conducted to examine sources of variation in the rate of violence in the groups judged to be at high risk. The first source of variation considered was that samples with overall higher rates of violence might produce higher rates in individuals classed as high risk, specifically. By definition, the overall rate of violence included the individuals judged to be at high risk. Therefore, to avoid double counting, we employed as a proxy the rate of violence in participants not classified as high risk.

Univariate analyses were also conducted to assess the effects of the following additional variables on rates of violence for individuals classed as high risk: the type of risk assessment instrument (actuarial *v.* SPJ), outcome location (community *v.* other), choice of outcome measure (criminal conviction *v.* other), gender (percentage of sample that was male), mean sample age (in years) and geographic location (North America *v.* other). The fitting algorithms weighted the data contribution of the different studies by taking into account the variances in each study.

Predictors found to be significant at the $P < 0.05$ level in the univariate analyses were entered into a multivariable logistic regression model to estimate adjusted effects. Backward elimination was used to drop non-significant effects from the model at the $\alpha = 0.05$ significance level. Odds ratios and their corresponding 95% confidence intervals were used to interpret the remaining significant effects. All regression analyses were two-tailed and controlled for sample size, time at risk and study design (prospective *v.* non-prospective).

The present study aimed to explain variability in rates of violence in high-risk groups using information from individual studies. It did not seek to estimate the overall magnitude of an effect comparing experimental and control groups. For this reason, binomial logistic regression taking into account the variances of the rates of violence in high-risk groups in individual studies was preferred to meta-analytic approaches such as those based on log odds ratios. To assess the sensitivity of our results to the choice of data-analytic method, however, a *post hoc* general linear model meta-analysis was conducted of the log odds of violence in groups classified as high risk as a function of the covariates discussed above weighting the studies by their inverse variances. Log odds of violence were modelled, rather than the log odds ratios employed by other meta-analytic reviews, owing to the absence of a control group. All statistical analyses were performed using SAS version 9.3 for Windows.

Results

Information was collected on 13 045 participants in 57 samples from 47 independent studies (Fig. 1).[25–71] The instrument with

the most predictive validity studies in which violence rates in high-risk groups were available was the VRAG (10 studies, 21.3%). The average sample was composed of 244 men (s.d. = 412) and had a mean age of 32.4 years (s.d. = 9.3). Approximately half of studies (21 studies, 44.7%) relied on criminal conviction as their outcome, with most studies using outcomes resulting from a violent incident in the community; such incidents were reported in 36 studies (76.6%). Studies were conducted in 13 countries, namely Argentina, Austria, Canada, Denmark, Finland, Germany, The Netherlands, New Zealand, Serbia, Spain, Sweden, the UK and the USA (Table DS1).

Outcome rates

Across instruments, the mean rate of violence for individuals classified as high risk was 54.8% (s.d. = 27.9, median = 57.6, interquartile range (IQR) 33.3–76.1, range 0.0–100.0) over an average time at risk of 55.4 months (s.d. = 41.8, range 0.9–194.4). The mean annualised rate of violence in high-risk groups was 23.1% (s.d. = 28.7, median = 12.9, IQR 6.5–19.0, range 0.0–100.0; $I^2 = 92\%$). The mean, standard deviation and range of rates per year of violence in individuals classed at high risk using each of the eight instruments are shown in Table 1. The distribution of annualised rates with respective 95% confidence intervals for actuarial and SPJ instruments are displayed in Figs 2 and 3. The I^2 indices of rates for actuarial and SPJ instruments are 89% and 76% respectively, indicating that the majority of variability in violence rates is not due to chance.

Binomial logistic regression

Univariate analyses demonstrated an increased rate of violence in non-high-risk groups, the use of an SPJ instrument, non-community follow-up, an outcome other than conviction, fewer men in a sample and younger participants were associated with increased rates of violence in high-risk groups (Table 2). Backward elimination multivariable logistic regression analysis revealed which factors remained significant after adjustment for other variables (Table 2). The odds of violence in the high-risk group were found to increase by 7% for every unit increase (absolute increase of 1%) in the violence rate of the non-high-risk groups. Individuals classed as high risk by actuarial instruments had 25% lower odds of committing a violent act than individuals classed as high risk by SPJ instruments. Finally, for every 1% decrease in the percentage of men in a study, there was a 2% increase in the odds of violence in individuals classified as high risk.

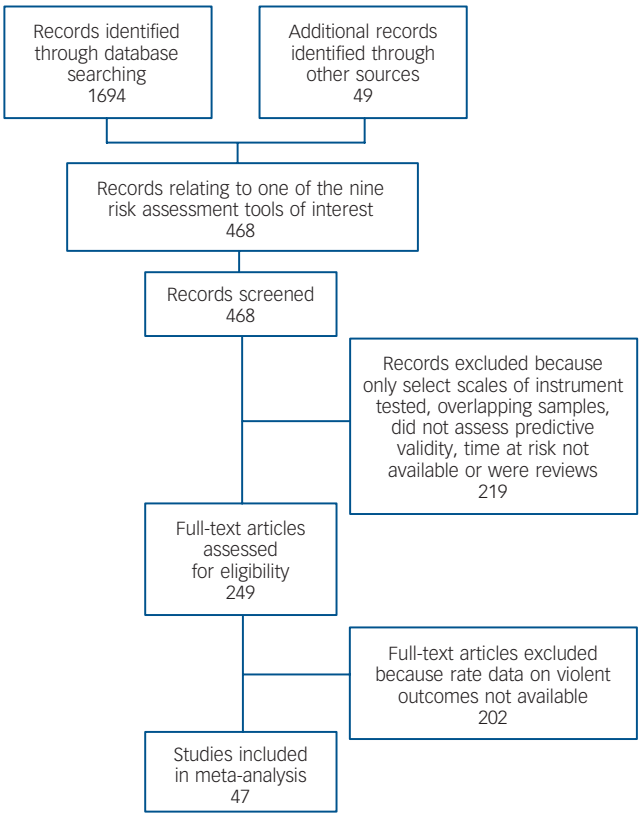

Fig. 1 Systematic search for predictive validity studies of commonly used structured violence risk assessment instruments.

Sensitivity analysis

General linear model meta-analysis of log odds for violence weighted by inverse variances produced similar results to logistic regression. In particular, backward elimination dropped the same predictors in the same order. The remaining significant predictors were the same, with similar effects.

Discussion

For structured instruments to be of greatest use to clinicians, the violence rates for high-risk groups in different clinical settings and

Table 1 Annualised rate of violence in individuals classified as high risk by eight widely used structured risk assessment instruments

		Annualised rate, %				
Instrument	High-risk group	*k*[a]	Min.	Max.	Mean	s.d.
Actuarial						
PCL-R[b]	Scores ⩾30	8	0.0	100.0	18.0	33.5
SORAG	Scores ⩾+20	6	0.0	19.0	10.4	6.6
Static-99	Scores ⩾6	9	3.4	13.6	7.1	3.5
VRAG	Scores ⩾+14	10	6.5	75.0	22.4	20.9
SPJ						
HCR-20	Professional judgement	9	5.0	100.0	40.6	43.8
SARA	Professional judgement	3	16.5	22.9	19.4	3.2
SAVRY	Professional judgement	9	4.3	100.0	38.6	27.6
SVR-20	Professional judgement	3	3.8	5.6	8.5	6.7

HCR-20, Historical, Clinical, Risk Management-20; Max., maximum; Min., minimum; PCL-R, Psychopathy Checklist – Revised; SARA, Spousal Assault Risk Assessment; SAVRY, Structured Assessment of Violence Risk in Youth; SORAG, Sex Offender Risk Appraisal Guide; SPJ, structured professional judgement; SVR-20, Sexual Violence Risk-20; VRAG, Violence Risk Appraisal Guide.
a. Number of samples.
b. Instrument not originally developed for the purpose of forensic risk assessment.

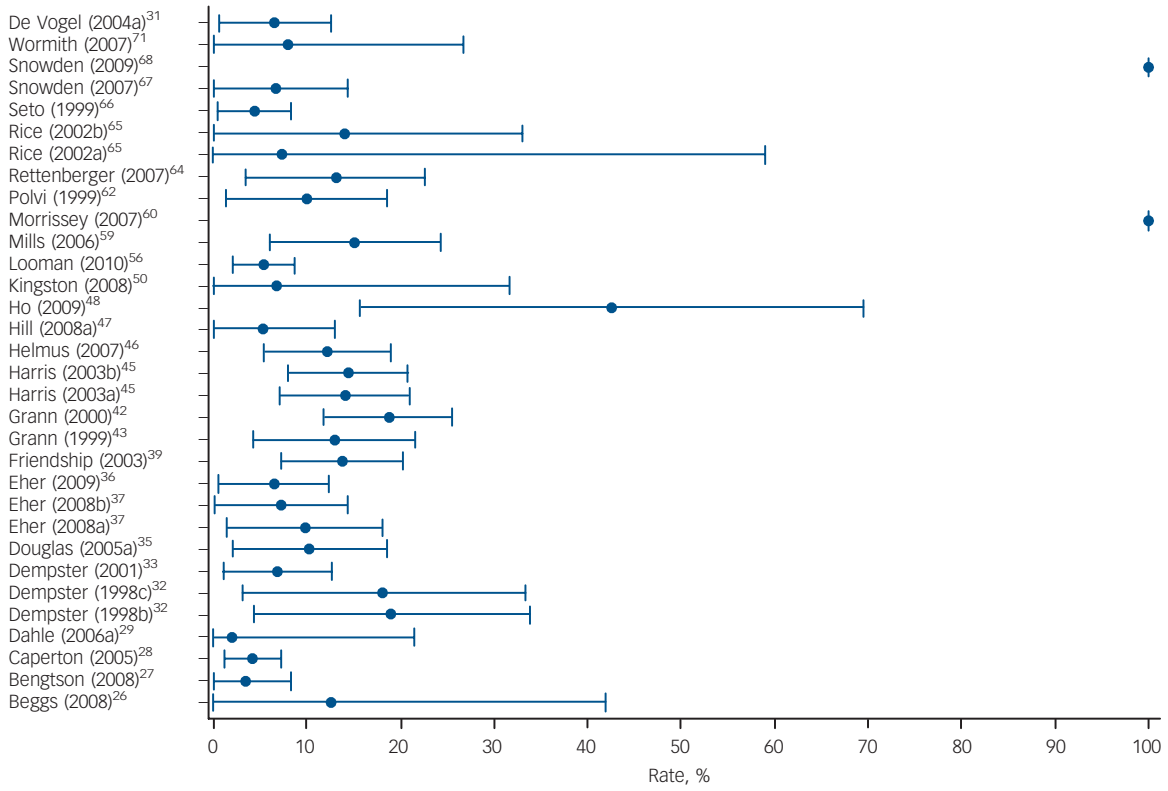

Fig. 2 Actuarial risk assessment instruments: annualised rates of violence in high-risk groups.

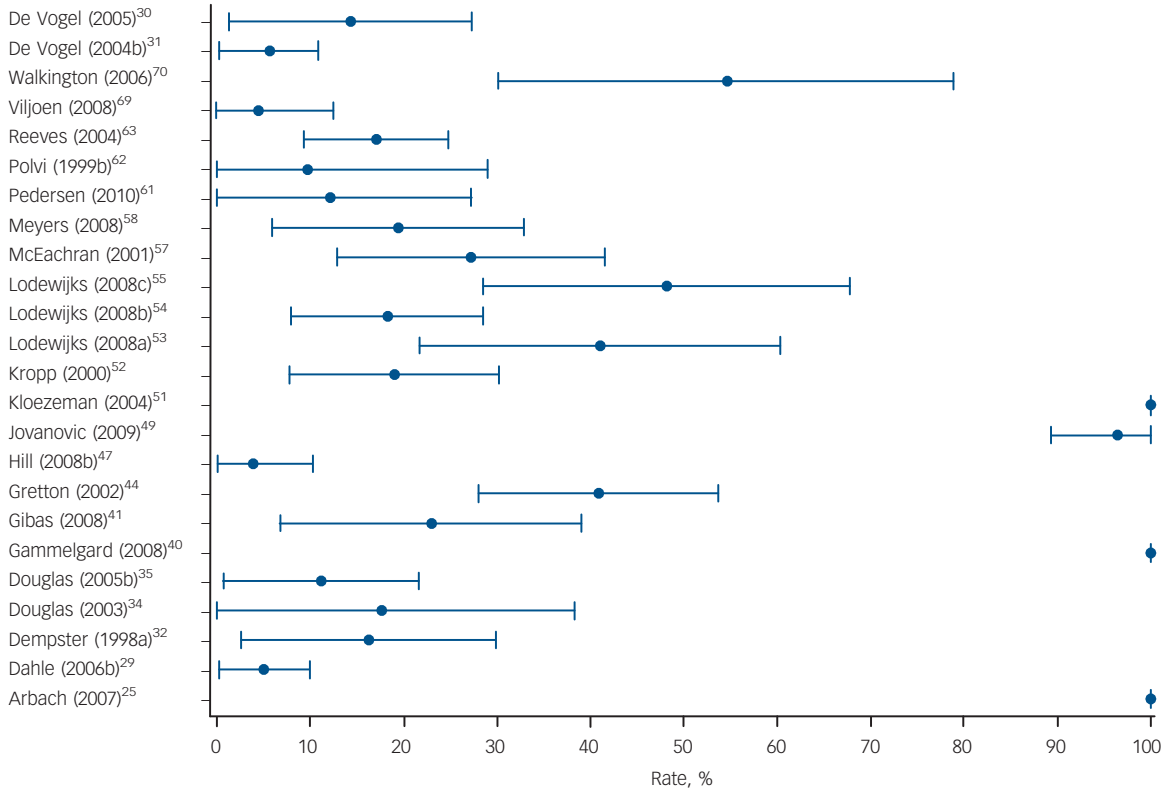

Fig. 3 Structured professional judgement risk assessment instruments: annualised rates of violence in high-risk groups.

different patient populations should be similar. The principal finding of this study is that, after adjusting for sample size, time at risk and study design, overall rates of violence in groups deemed high risk varied substantially both within and between instruments. Although the median annual rate of violence in high-risk groups is 12.9%, half of samples reported rates that were either below 6.5% or above 19.0%. The importance of considering local base rates of violence in the risk assessment process has been

Table 2 Predictors of rates of violence in individuals classified as high risk: binomial logistic regression

	Rate of violence in high-risk group ($k = 57$)[a]			
	Univariate		Multivariable	
	OR (95% CI)	*P*	OR (95% CI)	*P*
General risk level of sample: rate in non-high-risk groups	1.07 (1.06–1.08)	<0.0001	1.07 (1.06–1.07)	<0.0001
Type of risk assessment instrument: actuarial *v.* SPJ	0.53 (0.45–0.63)	<0.0001	0.75 (0.62–0.92)	0.004
Location of outcome: community *v.* other	0.36 (0.28-0.46)	<0.0001	NS[b]	
Choice of outcome measure: conviction *v.* other	0.66 (0.55–0.78)	<0.0001	NS[c]	
Gender: percentage men	0.97 (0.96–0.98)	0.002	0.98 (0.97–0.99)	<0.0001
Age: mean age of participants	0.96 (0.95–0.98)	<0.0001	NS[d]	
Geographic location: North America *v.* other	1.02 (0.87–1.20)	0.80	NA	

NA, not applicable; NS, not significant and dropped from model; OR, odds ratio; SPJ, structured professional judgement.
a. All analyses adjusted for sample size, time at risk and study design (prospective *v.* non-prospective); k = number of samples.
b. Variable dropped second from backward stepwise model.
c. Variable dropped third from backward stepwise model.
d. Variable dropped first from backward stepwise model.

discussed theoretically;[72] however, this variation in high-risk groups has (to our knowledge) not been demonstrated previously and provides empirical support for caution in the use of risk estimates derived from SRAIs to influence clinical decisions related to individual liberty and public safety (detention in general and forensic psychiatric hospitals, discharge from psychiatric hospital, release from prison and length of community supervision).[8,73] In particular it calls into question recommendations for the use of SRAIs that do not emphasise the role of local base rates.[74]

The variation in rates of violence in patients classified as high risk is not random, with elevated rates in studies where the rate of violence for non-high-risk patients (and hence in all patients) is increased, where an SPJ instrument is used, and in which there are fewer men. It has been argued elsewhere that applying probabilities from groups to individuals for the purposes of violence risk assessment is not reliable.[8] The data we report point to a different problem: that rates of violence in high-risk groups depend on local factors, and no general assumptions can be made about the probability of violent behaviour. That the rate of violence in patients classified as high risk varies with the base rate of the overall sample and that such local base rate information should be incorporated into individual risk assessments concords with Bayes' theorem.[75] However, there currently exists no resource that allows practitioners to systematically identify local base rates for different forms of violence in different psychiatric populations.

Previous studies have suggested that providing individuals undertaking risk assessment with such prevalence information might improve predictive accuracy.[76,77] Empirical evidence also suggests, however, that even when base rates are taken into account there remains substantial variation in the predictive accuracy achieved by different instruments in different settings.[10] Future research will be of greatest assistance to clinicians where it takes into account all of these variables in examining the performance of SRAI risk classifications.

Using the operational definitions of this study, individuals classified as high risk by actuarial assessments have reduced violence rates compared with those classified as high risk by SPJ instruments. As actuarial and SPJ approaches have similar predictive validity,[10,78] this is unlikely to be a consequence of SPJ instruments being more successful at identifying those who will be violent. It is more likely a consequence of the procedure that we, like previous researchers,[32] followed in defining an actuarial category corresponding to SPJ high risk. Nominal labels such as 'high', 'moderate' and 'low' are known to be interpreted inconsistently by clinicians and others.[79] Future comparisons of actuarial and SPJ approaches should consider using different ways of generating categories with similar levels of risk, perhaps by reserving high-risk classifications for actuarial scores higher than those we used.

Being male is a known demographic risk factor for violence. When a known risk factor is the source of systematic variation in violence rates for groups classified as high risk, this suggests that that risk factor is being allocated an incorrect weight. The error is capable of being made in either direction. In this case, structured assessments attributed too much weight to the increased risk associated with a person being male. The discovered effect is substantial: if the percentage of a sample is increased by, say, 10%, the odds of violence decrease by 22%. The explanation for this may lie in the threshold for admitting women to secure settings being higher than that for men, resulting in a population of women at higher risk of violence. This finding is consistent with previous research suggesting that being male is less of a risk factor in mental health populations than in the general population,[80–82] and that violence in female mental health populations is underrecognised.[83]

Limitations of the study

There are several potential limitations to this review. First, we did not seek to examine the full range of SRAIs available, of which there are over 150.[84] We did, however, choose those most commonly used in clinical practice according to a number of recent surveys. Second, we were unable to obtain rate information from all eligible studies as this information was rarely reported in manuscripts. However, the data presented here show that variation in rates of violence for individuals classified as high risk is a general phenomenon and is not limited to a particular instrument. Consequently, it seems unlikely that the use of different instruments or the inclusion of all eligible studies would have resulted in a more homogeneous set of samples. Third, the reliability of information used to administer the included risk assessment tools and the reliability of information used to determine outcome occurrence was not routinely reported to allow us to adjust for these potential moderators. It may be that there is less variation in violence rates for high-risk patients when assessments are made and outcomes detected using more reliable sources of information. Fourth, we did not have the necessary information to be able to investigate how findings might have changed when different thresholds were used to class individuals as high risk. It may be that using higher thresholds (resulting in increased specificity) could have resulted in an improved ability

to identify a small group of individuals at very high risk, although this would have also resulted in an increased rate of false negative predictions. Fifth, we needed to rely on the percentage of men in samples in our analyses rather than investigating the rate of violence in male and female high-risk groups separately. Therefore, caution may be warranted in interpreting the findings relating to gender as there may have been an aggregation bias in our continuous covariate. Finally, the number of samples for individual instruments was too small to investigate sources of rate heterogeneity in each instrument separately.

Future directions

In addition to addressing these shortcomings, future studies could examine whether variation in rates of violence for patients classified as high risk can be reduced by providing clinicians with information on outcome rates in individuals with similar clinical, geographical or criminal history backgrounds. A second area for future research concerns the operational definition of the term 'high risk'. Some of the variation between rates of violence in groups with the label may be a consequence of the inconsistent use of this term, suggesting that the use of more detailed operational definitions may reduce the degree of variation across studies and instruments.

As unstructured clinical assessments of violence risk remain common in practice,[6] a third area in need of further research is the investigation of variation in rates of violence in patients judged to be at high risk without the use of an SRAI. Data from social psychology suggest that clinicians using unstructured methods are likely also to take insufficient account of base rates in assessing risk.[85] Finally, the possibility that more effective supervision affects rates of violence in patients classed as high risk warrants further investigation.

Implications of the study

After controlling for time at risk, the rate of violence in patients judged to be at high risk by SRAIs is not constant, varying considerably and systematically within and between instruments. Therefore, it does not seem possible to use SRAIs to assign reliably a predetermined numerical probability to the potential for an individual to act violently. This raises the question of whether, if practitioners cannot make a reasonable estimate of the base rate for the population in question and hence cannot estimate the likelihood of a future violent act for a member of a category, they should be using high-risk categorisations at all. These findings support recommendations for caution, given the present state of knowledge, in the use of such probabilistic risk estimates to influence decisions related to individual liberty and public safety. The results of individual risk assessments should be reported with explicit acknowledgement of the possible sources of error associated with their use.

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reflection

On *The Discovery of the Unconscious: The History and Evolution of Dynamic Psychiatry* by Henri Ellenberger

Allan Beveridge

Henri Ellenberger's 1970s magnum opus has long been recognised as a classic. An encyclopaedic account of the emergence of dynamic psychiatry, it begins in the early pre-scientific era of primitive medicine, examines the advent of mesmerism in the 18th century, depicts the amazingly fertile culture of 19th-century Europe, and concludes in the mid-20th century with the rise of psychoanalysis. When I first became aware of the book as a trainee at the Royal Edinburgh Hospital, I have to admit I was not immediately taken with it. For a start, it was nearly a 1000 pages long and it seemed to focus entirely on dynamic psychiatry to the exclusion of other approaches. However, closer acquaintance with it over the years has revealed its great merits.

Henri Ellenberger (1905–1993) was an interesting individual. Born in southern Africa into a French-speaking Swiss family, he studied medicine in Paris, trained in psychiatry and moved to Switzerland where he became acquainted with Manfred Bleuler, Ludwig Binswanger and Carl Jung, before relocating to North America to work in the Menninger Clinic and latterly in Montreal. He spoke six languages, studied philosophy and literature, and was immersed in European culture.

As the historian Mark Micale reveals, Ellenberger was something of a man out of time. He was not based at a university department and, as a result, was isolated and deprived of institutional support to carry out his research. He used his holidays to visit historical archives and wrote *The Discovery of the Unconscious* at home in the evenings after the clinical day. Ellenberger's book came out when the tide had turned against psychodynamic approaches; by this stage his psychiatric contemporaries were more interested in biological treatments. In addition, few of them saw the value of the historical perspective. Nevertheless, Ellenberger produced a pioneering and enduring work. For me, he demonstrated the importance of a knowledge and understanding of the cultural context in which psychiatric ideas emerge. Psychiatry is not something separate from culture: it is part of it. Ellenberger's chapters on Europe in the 19th century are a tour de force. With his references to the novelists and playwrights of the day, such as Dostoyevsky, Stevenson and Schnitzler, and to thinkers like Nietzsche, Schopenhauer, Marx and Darwin, Ellenberger vividly evokes the hotbed of ideas out of which psychoanalysis was borne. He also establishes that Freud, despite his personal mythology, was very much influenced by the writings of his time.

Indeed, a key aspect of the book is Ellenberger's portrayal of the founder of psychoanalysis in terms of the 'hero myth'. In this myth, the hero is the lone figure arising *de novo*, boldly introducing revolutionary ideas which are initially greeted with hostility by his uncomprehending contemporaries, but who is vindicated in the end when his theories are acclaimed. In this mythological version, the scientific and cultural context out of which the 'hero' arises is obliterated. Ellenberger's great contribution has been to reinstate this lost context and to provide us with a much deeper understanding of Freud and the origins of his thought.

To someone, like myself, who has written about the history of psychiatry, Ellenberger's work has proved exemplary. He showed the value of being sceptical of the received narratives of psychiatric progress, and his book demonstrated the importance of going back to primary sources to attain a truer picture of the past. Ellenberger is also a model of the clinician-historian, working outside the academy, whose isolated position nevertheless affords him independence and an original outlook, unrestrained by sectarian dogma.

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