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Female Sexual Victimization Predicts Psychosis: A Case-Control Study Based on the Danish Registry System

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Objective: **An increasing research literature has identified a statistical association between trauma exposure and psychosis. Methodological limitations, primarily relating to failures to establish the temporal ordering of events and relying on retrospective self-reports, have made the argument for a causal association difficult to establish.** ***Method:*** **A case-control study was conducted based on data from the Danish Civil Registration System and the Danish Psychiatric Central Register. All female visitors to a rape center during the index year (2003) were matched with controls based on age and area of residence. Information on previous and subsequent diagnoses of psychosis was extracted from the registers for cases and controls.** ***Results:*** **A hierarchical binary logistic regression was used with demographic variables, preindex psychosis, and rape center attendance as predictor variables, and the dependent variable was a postindex year diagnosis of psychosis. The OR associated with sexual victimization (OR = 10.04; 95% CI 2.50–40.33) indicted an increased likelihood of psychosis while controlling for the other predictors in the model.** ***Conclusions:*** **This study found that sexual victimization significantly increased the likelihood of a diagnosis of psychosis and therefore suggests that there may be a role for traumatic experiences in the etiology of psychosis.**

Key words: sexual victimization/psychosis/Danish Registry System

Introduction

Recent research has provided evidence that the experience of traumatic experiences may be implicated in the etiology of psychotic disorders and symptoms. Such studies have found significant associations between self-reported traumatic events and indicators of psychosis in both large community samples and clinical samples. Many of these studies have controlled for potential confounding variables.

The relationship between trauma and psychosis has been reported based on large nationally representative samples from the United States,[1] Britian,[2–4], Germany,[5] Australia,[6] and the Netherlands.[7] A dose-response relationship has also been reported based on the total number of different traumatic experiences and a diagnosis of psychosis.[8] The positive features of these studies were that they have generally assessed a broad range of traumatic experiences, have used both diagnostic- and symptom-based outcomes, were based on large samples, and have controlled for potentially confounding variables. Despite providing valuable findings such designs generally have some weaknesses. The main limitation is that many of these studies are retrospective in nature. This means that the temporal ordering of the trauma-psychosis association cannot be established. Furthermore, reliance on self-reported trauma histories rather than objectively collaborated assessments, raises concerns about the validity of such measurements. It is possible that the number and severity of traumas could be exaggerated thereby increasing the probability of incorrectly finding a significant association. Similarly, the usefulness of using information on psychotic symptoms rather than the clinical diagnosis of a psychotic disorder has been questioned[9] as such experiences may have little or no clinical significance.

Other studies have been based on clinical samples and noted the high prevalence of traumatic experiences. In particular, high rates of sexual abuse in childhood have been reported in psychiatric samples with a diagnosis of psychosis[10–13] and bipolar affective disorder.[14] The severity of trauma appears to be associated with the level of symptom severity.[15,16] These studies indicated that trauma may be implicated in the etiology of psychotic disorders rather than just psychotic-like experiences. However, these studies also suffer from methodological weaknesses associated with their cross-sectional design and assessment of trauma experiences. Alternative explanations for these findings are that people who

develop serious mental health problems are subsequently more vulnerable to sexual victimization, or reports of sexual victimization may represent delusionary beliefs.

There have been a number of literature reviews on the evidence for a relationship between trauma and psychosis in general,[17,18] and trauma in childhood in particular.[19–21] Although the evidence of a statistical association is available, inferences about causality are not possible. A recent review of the evidence base of childhood trauma and psychotic disorders provided an extensive methodological critique of the existing research literature and suggested that future research needs to include objective assessments of trauma, employ control groups, and be longitudinal in nature.[22]

This study aimed to test the hypothesis that exposure to sexual victimization would predict a subsequent diagnosis of psychosis in a sample of Danish females. It was predicted that experience of sexual victimization would increase the likelihood of receiving a diagnosis of psychosis after controlling for previous diagnosis of psychosis and other demographic variables. This study will add to the existing research by (1) using an objective behavioral indicator of sexual victimization rather than self-report, (2) using a formal clinical diagnosis of a psychotic disorder, (3) statistically controlling for any psychosis diagnoses preexposure to sexual victimization, and (4) using a matched control group to assess psychiatric differences between those exposed and nonexposed to sexual victimization.

Methods

Participants

This study was based on the Danish Civil Registration System (CRS) and the Danish Psychiatric Central Register (PCR). A detailed description of the structure of CRS was provided by Pedersen et al.[23] Access to CRS data was through "Denmark Statbank" (DST), which is the central government agency for statistics. In order to use CRS data, researchers must apply to DST from an authorized institution. The research proposal needs to be approved by the Danish Register Data Board ("Datatilsynet"), which is the agency responsible for all studies using register data and by the Health Board ("Sundhedsstyrelsen"), a department of the Danish Ministry of Health, which is the agency responsible for all studies involving public health data. This study received all necessary approvals and also ethical approval was granted by Aarhus University. On the basis of the research proposal, DST make data available on the relevant variables to the researchers, and variables are matched using the individual civil registry number (CPR). The CPR identifies people at the individual level and allows information to be collated across different registries. Identification of individuals is not possible as the 10-digit CPR numbers were scrambled prior to release. The data are also protected by initial password and access also requires the correct "time code" to be entered; this is an alphanumeric code that changes every minute and provided by a digital key.

The cases were 103 females who attended the Center for Rape Victims (CRV) at the University Hospital in Aarhus (Denmark) during the index year (January 1, 2003 to December 31, 2003). The CPR information was used to extract a matched control group from the CRS, with 20 controls for every case ($N = 2060$). Controls were excluded if they had visited the CRV since 1999. The ratio of cases to controls equates to a prevalence rate of sexual victimization of 5%; this value is an approximate average of the prevalence estimates from official statistics and the self-report estimates for Nordic countries. The CPR number for 20 controls did not match with PCR, so the effective total sample size was 2143.

The 8 Danish CRV's offer services to anyone from the age of 12 years who reported any type of sexual assault. The CRV's website offers information for friends and family of rape victims, but the CRV is only available to victims themselves. The CRV offers free access to specially trained nurses, medical treatment, forensic examination, counseling by licensed psychologists, and a highly structured follow-up procedure in one location. CRV's are open 24 h a day, and referrals or police involvement are not required in order to utilize the services offered. If a victim of rape presents at a police station or contacts the police, they are immediately transported to the CRV where the police questioning and all other examinations and treatments will take place. The CRV will only serve victims within 72 h of the assault. There is a separate regional center to support victims of child sexual abuse. Information about the CRV's is available through public and private medical clinics, libraries, educational institutions, and the Internet. See Bramsen et al[24] for a detailed description of Danish CRV's. The Aarhus CRV serves the 26 municipalities (populations ranging from 4085 to 307 000) of Aarhus County (population 661 370).

Estimates for 2003 from DST, the central government agency for statistics, showed that there were 73 reported rape in Aarhus County and 453 for all of Denmark. Based on government population estimates for 2003, these equate to 0.008% and 0.011%, respectively for both males and females and 0.016% and 0.022% for females only. This is likely to underestimate the true prevalence as not all rapes are reported to the police. Indeed, self-reported rates of sexual victimization are much higher; 14% of females from the Danish National Health and Morbidity Survey claimed at least once experience of actual, or attempted, forced sexual activity, and the estimate for forced sexual activity based on the Prevalence and Health Sequels of Violence project was 4.6%. A study of police reported and unreported rape cases in Aarhus County examined the relationship between the type of rape (stranger, date rape, and partner rape) and reporting

Table 1 Comparison of Characteristics of Groups Based on Diagnosis of Psychosis and Cases and Controls

	Psychosis Diagnosis 2003–2007			Cases and Controls		
	No, $N = 2130$	Yes, $N = 13$	χ^2 (*df*), *P*	Cases, $N = 103$	Controls, $N = 2040$	χ^2 (*df*), *P*
Living status						
Single, *n* (%)	730 (35.6)	9 (69.2)	6.33 (1), .01	64 (64.0)	675 (34.4)	36.19 (1), .00
Ethnicity						
Immigrant, *n* (%)	261 (12.6)	2 (15.4)	0.09 (1), .76	8 (7.8)	255 (12.9)	2.22 (1), .13
Children						
1 or more children, *n* (%)	1317 (61.8)	3 (23.1)	8.20 (1), .00	48 (46.6)	1272 (62.4)	10.28 (1), .00
Psychosis						
Diagnosis 1993–2002, *n* (%)	7 (0.3)	6 (46.2)	405.01, (1), .00	6 (5.8)	7 (0.3)	48.87 (1), .00
Sexual victimization						
CRV attendance 2003	96 (4.5)	7 (53.8)	68.74 (1), .00			
			t (*df*), *P*			t (*df*), *P*
Income (DKK), mean (SD)	111 906 (104 843)	81 340 (64 499)	1.05 (1699), .29	83 734 (76 865)	113 215 (105 748)	2.59 (1699), .01

Note: Due to small amount of missing data on some demographic variables (4%), the percentages may not exactly correspond with headline frequencies. CRV, Center for Rape Victims.

status (police report and CRV attendance, police report but no CRV attendance, no police report but CRV attendance). There was no association between rape and reporting status ($\chi^2 = 9.07$; $df = 4$; $P = .06$) (The chi-square analysis was not reported by Rohde et al but conducted by the authors of this paper based on the frequencies reported. The one ''undetermined'' case was excluded from the analysis) which suggested that the CRV's do not tend to receive particular types of rape victim.

Measures

Sexual victimization was operationalized by having visited the CRV at any time during 2003, with no previous recorded visits since 1999. No information on the number of visits or details of the rape was available. Other variables were used to describe the demographic characteristics of the sample during the year preceding the index year: (1) living status (0-married/cohabiting, 1-single), (2) ethnicity (0-nonimmigrant, 1-immigrant/2nd generation), (3) children (0-no children, 1-one or more children), and (4) annual income (DKK).

Every time a person has contact with a psychiatric hospital or department in Denmark, they receive an ICD-10 diagnosis code that is recorded on the PCR. The diagnosis is made by a psychiatrist. For this study, we combined information on the PCR and CRS to identify which cases and controls had received a diagnosis of schizophrenia, schizotypal, or delusional disorder; specifically, a diagnosis based on ICD-10 codes F20–F25 and F28–F29. The data from DST used the same scrambled CPR for both the civil and psychiatric registries to allow matching. The occurrence of a diagnosis was recorded separately for 2 time periods. The first time period covered 10 years (January 1, 1993 to December 31, 2002) and the second time period covered 5 years (January 1st, 2003 to December 31st, 2007). This resulted in 2 variables that indicated if a person had received a diagnosis of a psychotic disorder in the 10 years preceding the index year (preindex psychosis) or during the 5 years after the start of the index year. These variables represented psychosis in the analysis.

Results

The females who visited the rape center were aged from 13 to 87 years (mean = 26 years, SD = 13.41). The controls were matched for age and municipality. Chi-square analyses were conducted to compare the characteristics of the diagnosed and nondiagnosed groups (based on both cases and controls) based on data from 2003 and the cases and controls. The results are shown in table 1.

The results indicated that the women in the psychosis group was more likely to be single, not have children, have a previous diagnosis of psychosis, and have experienced sexual victimization. The cases were more likely to be single, have children, have a previous diagnosis of psychosis, and have lower income. These differences were statistically controlled for in the multivariate analysis.

A multivariate analysis was conducted using hierarchical binary logistic regression. The dependent variable was a psychosis diagnosis from 2003 to 2007. The variables representing living status, ethnicity, children, annual income, and preindex psychosis were entered in the first block. The second block included the sexual victimization variable. The results are reported in table 2.

The first block of the regression model was significant ($\chi^2 = 50.89$; $df = 5$; $P = .00$) and indicated that a previous diagnosis of psychosis was the only significant predictor of a postindex year diagnosis of psychosis. The OR was 330.42 (95% CI 55.23–1966.10). When the sexual victimization variable was entered in the second block this resulted in a significant model ($\chi^2 = 59.81$; $df = 6$; $P = .00$),

Table 2 Estimates from Hierarchical Binary Logistic Regression Model Predicting Diagnosis of Psychosis

	B	SE	*df*	OR (95% CI)	*P*
Living status					
Single	−.61	0.91	1	0.55 (0.09–3.25)	0.51
Ethnicity					
Immigrant	.47	0.87	1	1.61 (0.29–8.88)	0.59
Children					
1 or more children	−1.21	0.97	1	0.30 (0.05–1.98)	0.21
Income (DKK)	.00	0.00	1	1.00 (1.00–1.00)	0.09
Psychosis					
Diagnosis 1993–2002	5.15	0.99	1	172.77 (24.55–1215.95)	0.00
Sexual victimization					
CRV attendance 2003	2.31	0.71	1	10.05 (2.50–40.33)	0.00

Note: CRV, Center for Rape Victims.

which was a significant improvement over the previous model ($\Delta\chi^2 = 8.92$; $\Delta df = 1$; $P = .00$). The OR associated with sexual victimization (OR = 10.05; 95% CI 2.50–40.33) indicted an increased likelihood of psychosis of approximately 10 times while controlling for the other predictors in the model. The OR associated with a previous diagnosis of psychosis reduced to 172.77 (95% CI 24.55–1215.95) in the second block.

There were 3 cases where the temporal ordering of events could not be established unequivocally during 2003. For all other cases, it was established that sexual victimization preceded the diagnosis. The analysis was conducted again with these 3 cases removed; the OR for sexual victimization remained similar and statistically significant (OR = 10.93; 95% CI 1.98–60.25), and the OR for a previous diagnosis of psychosis increased (OR = 380.09; 95% CI 35.80–4035.50).

Discussion

This study aimed to estimate the effect of sexual victimization on receiving a subsequent diagnosis of psychosis based on a sample of Danish females and a control group matched for age and area of residence. After controlling for demographic variables and a previous diagnosis of psychosis, the measure of sexual victimization significantly improved the statistical model and indicated a significant increased likelihood of a diagnosis of psychosis.

There have been consistent reports of the association between exposure to traumatic events and psychosis in both population[1–7] and clinically based studies.[10–13] This study was different in that it examined changes in psychiatric records before and after sexual victimization thereby focusing on a trauma-exposed sample, an approach previously employed by Kilcommons et al.[25] This design overcame many of the limitations identified by Bendall et al[22] and also employed a control group, used an objective measure of sexual victimization, and used a formal psychiatric diagnosis as an outcome. The use of registration system data was similar to the approach taken by Spataro et al[26] in a study that linked the records of the Victorian Institute of Forensic Medicine to identify cases of child abuse and the Victorian Psychiatric Case Register to identify psychiatric diagnoses. The Spataro et al. study did not find a significant association between child abuse and schizophrenia; however, this may have been due to the limitations identified by Read et al.[20]

The magnitude of the effect of sexual victimization on psychosis found in this study is similar to those reported in the Bebbington et al[2] study for exposure to violence in home (OR = 9.0), running from home (OR = 11.5), or having stayed at a children's institution (OR = 12.0) but smaller than that for sexual abuse (OR = 15.5). It is also similar to the reported association (OR = 11.5) between self-reported physical, sexual, emotional, or psychological abuse and psychosis severity (defined as need for care) in the Janssen et al[7] study. Scott et al[6] reported a stronger effect between rape and delusional experiences (OR = 18.1), although this related to participants who also were diagnosed with posttraumatic stress disorder. This suggests that estimates from population-based studies do not necessarily inflate the association between trauma and psychosis due to the false positive endorsement of traumas.

The mechanisms by which trauma is a factor in the etiology of psychosis remains unclear. One model proposed that childhood physical and/or sexual abuse results in overreactivity of the hypothalamic–pituitary–adrenal axis.[27] However, there are models that accommodate psychosis as the result of exposure to sexual victimization as an adult. A recent review[28] noted 2 studies that reported significant increases in release of dopamine as the result of psychosocial stress[29,30] but stressed the importance of considering the interaction between stress and genetic vulnerability to psychosis. Read et al[10] identified significant associations between exposure to child or adult trauma and the diagnosis of psychosis and hallucinatory experiences based on the analysis of medical case notes. However, the psychosis and hallucinatory experiences were most strongly associated with exposure to both child and adult trauma. The authors reviewed possible cognitive, attributional, and neurodevelopmental models.

Research has provided evidence that sexual victimization is associated with a broad range of behavioral[31] and psychological problems, including posttraumatic stress disorder,[32] recurrent depression, self-harming behavior, suicidal attempts,[33] alcohol abuse,[34] and disordered eating.[35] This study suggested that psychosis is another possible outcome associated with sexual victimization, although the effect of such victimization on other psychiatric diagnoses was not examined. This has implications

for the type of support and treatments that are offered to victims. There have been attempts at early intervention during the prodromal phase of psychotic disorder using antipsychotic medication, but the results have been equivocal.[36,37] There has been some support for psychological in particular cognitive behavioral-based treatments for people at high risk of psychosis.[38,39]

This study had a number of limitations. There are a number of risk factors for psychosis that were not controlled for in this study. First, increased rates of sexual assault have been reported for females who were victims of child sexual abuse,[40] and this has been implicated in the etiology of psychosis. This study did not control for child sexual abuse or any other traumatic experiences. In addition, information on drug use and genetic vulnerability to schizophrenia was not taken from the registry. Failing to control for these variables may have increased the observed effect. The design of the study also meant that the status of cases and controls could be unequivocally established; there was no independent verification that the cases had actually been subjected to an attempted or completed rape, and not all women who experience sexual victimization will have attended the CRV. Furthermore, details of the nature of the assaults and the degree of physical force or the type of assailant are unknown. However, it is more likely that cases were misclassified as controls given the large number of unreported incidences of rape. This would reduce the probability of detecting a significant effect. The final limitations are that for 3 cases, the temporal ordering of attendance at the CRV and the diagnosis of psychosis during 2003 was not known, and the specificity of the rape-psychosis relationship was not established as other nonpsychotic diagnoses were not examined.

In conclusion, this study found that sexual victimization significantly increases the likelihood of a diagnosis of psychosis. This study employed a case-control design and controlled for demographic variables and previctimization psychiatric history. This suggests that there may be a role for traumatic experiences in the etiology of psychosis. The findings have important implications for clinical assessment and treatment formulation, particularly in light of the finding that abuse history is often ignored during assessment[41]; a thorough assessment of traumatic experiences in individuals with psychotic experiences may provide important considerations for case formulation and offer opportunities for focusing and directing psychotherapeutic interventions.

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