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**Testing complex hypotheses using secondary data analysis: is the association between sexual abuse and psychosis moderated by gender in a large prison sample?**

Prospective (Janssen et al. 2004), data linkage (Cutajar et al, 2010; Elklit & Shevlin, 2011) general population, (Bebbington et al, 2004; Shevlin, Dorahy & Adamson, 2007) and clinical studies (Lysaker, Davis, Gattton, & Herman, 2005) have repeatedly identified links between trauma and psychosis. Mechanisms by which these experiences may be linked have also been postulated (Read, Perry, Moskowitz, & Connolly, 2001; Bentall & Fernyhough, 2008). To date, while most studies have estimated the relationship in samples of males and females, or females only, few studies have explicitly tested if the trauma-psychosis relationship is moderated by gender. Those studies that have reported gender differences have offered conflicting findings. Shevlin, Dorahy and Adamson (2007) for example, reported a significant rape by gender interaction in predicting psychosis among members of the general population in the United States of America (National Comorbidity Survey), with higher odds ratios for males compared to females. Bebbington et al. (2011) however suggested that the link between sexual abuse and psychosis was moderated by sex among members of the general population in the United Kingdom (British Psychiatric Morbidity Survey), and that this association was stronger for females. Moreover, a recent case control study by Fischer et al. (2009) also suggested that CSA among first episode psychosis sufferers (Aetiology and Ethnicity in Schizophrenia and Other Psychoses (AESOP) study) represented a specific threat for females compared to males.

However, robust testing of such moderated effects has been difficult as the prevalence of psychosis in population studies has been low, and reported rates of sexual trauma for males have also been low. A failure to detect moderation may therefore be due to a lack of statistical power. While general population data may not afford suitably proportioned prevalence of both phenomena across the sexes to facilitate moderation based analyses, alternative population data may.

This paper aimed to demonstrate that secondary data analysis can be a useful methodological approach to testing complex psychological hypotheses. In this case data from the Survey of Psychiatric Morbidity among Prisoners in England and Wales was used. This is a large scale psychiatric survey and due to the sample characteristics avoided many of the methodological limitations of previous studies. In particular the low base rates of psychosis and male sexual trauma has resulted in statistical tests of association that have low power. However previous research has indicated that the prevalence of psychosis in prison populations is higher than for the general population (Brugha et al, 2005; Birmingham, Mason, & Grubin, 1996) and that there are higher rates of childhood and adult traumatic experiences, in particular child abuse, for both males and females (Carlson & Shafer, 2010; Malacova et al, 2012). Therefore this study aims to test if the relationship between sexual abuse and psychosis is moderated by gender using a large sample of male and female prisoners from England and Wales.

## **Method**

### **Sample**

The data for the current study was based on the Survey of Psychiatric Morbidity among Prisoners in England and Wales (Singleton, Meltzer, Gatward, Coid & Deasey, 1998) which was conducted to estimate the prevalence of mental disorders

in the prison population. The sample comprised prisoners from all 131 prisons in England and Wales. Participants were randomly selected from three groups using sampling fractions (male remand 1 in 8, male sentenced 1 in 34, and female remand and sentenced prisoners 1 in 3). A total of 3,563 prisoners were recruited and 3,142 (88%) completed the survey of whom 75.5% were male. Male prisoners and female prisoners had the same modal age group (25-29 years). Slightly over half of the sample (54.3%) was sentenced with the remainder on remand, and the percentage of males (65.6%) who were sentenced was higher than females (34.3%:  $\chi^2 = 189.96$ ,  $df = 1$ ,  $p < .001$ ). 59.2% of the sample had been in prison before, and this was more common for males ( $\chi^2 = 257.28$ ,  $df = 1$ ,  $p < .001$ ). There were more females (25.0%) than males (21.6%) who had been in prison for more than 1 year ( $\chi^2 = 8.64$ ,  $df = 1$ ,  $p < .05$ ). Details of the sample and survey methods can be found in Singleton et al (1998).

### *Psychosis and Sexual Victimization*

A random subsample of 1 in 5 participants were interviewed with the Schedule for Assessment in Neuropsychiatry (World Health Organization, 1999) by psychiatrists or psychologists for assessment of a psychotic disorder. From this data an algorithm was used to identify those factors which were predictive of a diagnosis of 'probable psychosis' for the non-selected participants based on the following criteria: (1) self-reported use of anti-psychotic medication, (2) admissions to hospital for mental health reasons, (3) self-reported diagnosis or symptoms of psychosis and (4) endorsement of the probe and secondary item relating to auditory hallucinations in the Psychosis Screening Questionnaire (Bebbington & Nayani, 1995). This combination of responses was found to be predictive of the presence of psychosis in

those also assessed with the SCAN. Psychosis presence in the current analysis was coded as '1' and psychosis absence was coded as '0'.

The question relating to sexual victimization was taken from the 'Key Life Events and Post Traumatic Stress' section of the questionnaire. Participants were presented with cards with lists of stressful life experiences and were asked, "Looking at the card, could you tell me if you have ever suffered from any of the problems or events shown on the card". The first card included "Sexual abuse" and participant responses to this were coded 'Yes' (1) or 'No' (0).

#### *Control variables*

A range of demographic variables, potential confounding variables, and clinical variables were also entered in the analysis as control variables. These were:

*Gender:* Female (0), Male (1).

*Age:* Age was collapsed into 7 categories: (1) 16-20, (2) 21-24, (3) 25-29, (4) 30-34, (5) 35-39, (6) 40-44, (7) 45+ years.

*Living status:* Participants were asked "Just before you came into prison were you living..."; responses were coded as 'Alone' (1) and 'Other' (0).

*Employment:* Participants were asked "Just before you came into prison did you have any kind of paid work?" and responses were coded 'No' (0) or 'Yes' (1) .

*Education:* Participants were asked "Have you got any qualifications of any sort?" and responses were coded 'No' (0) or 'Yes' (1) .

*Immigration:* Participants were asked which country they were born in and the responses were coded 'United Kingdom' (1) or 'Other' (0) .

*Common mental disorders.* The Clinical Interview Schedule (CIS-R) was used to produce specific ICD-10 diagnoses for six 'neurotic' disorders. This was recoded to indicate if each participant had at least one 'neurotic' disorder (1) or no 'neurotic' disorder (0).

*Problem drinking.* Identification of hazardous alcohol use was based on a score greater than 8 on the Alcohol Use Disorders Identification Test (Saunders et al, 1993).

*Cannabis use:* The 'Drug Use' section of the questionnaire included questions on the frequency of drug use. A derived variable was "Used cannabis in year before prison" and this was coded 'Yes' (1) or 'No' (0).

*Other traumas.* Participants were presented with a list of stressful life events from the "List of Life Threatening Experiences" (Brugha, Bebbington, Tennant, & Hurry, 1985). Participants were asked if they had experienced "Bullying", "Violence at work", "Violence in the home", and "Homelessness". From the "Background Details" the question "Were you ever taken into Local Authority Care (that is into a children's home or foster care) as a child up to the age of 16?" was also used. All responses were coded 'Yes' (1) or 'No' (0).

## **Analysis**

A multi-group (gender) binary logistic regression model was specified with the dependent variable as 'probable psychosis'. The predictors included all the demographic and clinical variables and the sexual victimization variable. This model was estimated twice. Model 1 was estimated with the regression co-efficient for the

'sexual victimization' variable constrained to be equal for males and females, and Model 2 estimated the regression co-efficient for the 'sexual victimization' variable separately for both males and females. The difference in fit between the two models was assessed using the likelihood ratio test, and moderation was inferred based on the statistical difference between Model 1 and Model 2. The Bayesian Information Criterion (Schwartz, 1978) was also used to assess the relative fit of the models. The model with the lowest BIC was considered to be the better model, and a difference greater than 10 was considered to be indicative of a 'significant' difference (Rafferty, 1995). All analyses were conducted using Mplus7.00 (Muthén & Muthén, 2012) using robust maximum likelihood estimation. For all analyses weighting was used so that the interviewed samples in the first stage interviews reflected the prison population.

## Results

The percentage of all participants that met the criteria for 'probable psychosis' was 8.3% (95% CI 7.34 -9.26%). The prevalence was higher for females (12.7%; 95% CI 10.35 – 15.05%) than males (6.9%; 95% CI 5.88 – 7.92%) and the difference was significant ( $\chi^2= 26.02$ ,  $df = 1$ ,  $p < .001$ ). Sexual abuse was reported by 14.3% of the sample and the rate was higher for females (31.9 %; 95% CI 28.61 – 35.19%) than males (8.5%; 95% CI 7.38 – 9.62%) and the difference was significant ( $\chi^2= 260.30$ ,  $df = 1$ ,  $p < .001$ ). The association between probable psychosis and sexual abuse was statistically significant ( $\chi^2= 147.92$ ,  $df = 1$ ,  $p < .001$ ; OR = 4.84 95% CI 3.68 – 6.34) for the total sample, and for females ( $\chi^2= 44.42$ ,  $df = 1$ ,  $p < .001$ ; OR = 4.13 95% CI 2.66 – 6.42) and males ( $\chi^2= 75.10$ ,  $df = 1$ ,  $p < .001$ ; OR = 4.72 95% CI 3.22 – 6.91) separately.

The difference in model fit between the constrained and unconstrained binary logistic regression models was not statistically significant ( $\chi^2 = .02$ ,  $df = 1$ ,  $p = .89$ ). The BIC for the constrained model was lower (BIC= 5217.42) than that for the unconstrained model (BIC= 5225.47) and the difference was small. This indicated that the model with equal regression coefficients for males and females did not differ from the model with gender specific coefficients. The simpler model therefore should be preferred on the basis of parsimony. This suggested that the relationship between sexual trauma and probable psychosis was not moderated by gender, indeed the estimates from the unconstrained model were very similar for males (OR = 2.59; 95% CI 1.66 - 4.03) and females (OR = 2.61; 95% CI 1.60 - 4.26). The estimates from the constrained model are reported in Table 1.

Table 1 here

## Discussion

Firstly, our findings add to the now overwhelming evidence that sexual abuse, like many other adversities (Varese et al, 2012), is a risk factor for psychosis. Bivariate analysis indicated that for the whole sample there was almost a five-fold increase in the likelihood of probable psychosis given a history of sexual abuse. A recent meta-analysis, of the 41 most rigorous studies of childhood adversity (sexual abuse, physical abuse, emotional abuse, neglect, bullying and parental death) found that people who had suffered childhood adversity were 2.8 times more likely to develop psychosis than those who had not. Nine of the ten studies that tested for a dose-response relationship found it to be significant. The odds ratio for sexual abuse was 2.38 ( $p < .001$ ). All of the 20 sexual abuse studies found that people who had been



sexually abused were more likely to be psychotic later in life, with odds ratios varying from 1.4 to 9.7. In 17 of the 20 the difference was statistically significant.

Secondly, our findings show that the relationship between sexual abuse and psychosis is neither specific to, nor moderated by, gender. This is consistent with previous studies, other than that of Fischer et al. (2009). In the 2012 meta-analysis (Varese et al, 2012) the association between adversity and psychosis was significant for the ten studies that controlled for the effect of gender (OR = 2.52,  $p < .001$ ). More specifically, those studies that have controlled for gender, have found significant relationships between sexual abuse and hallucinations (Shevlin, Dorahy, & Adamson, 2007; Whitfield, Dube, Felitti, Andra, 2005) delusions, (Scott, Chant, Andrews, Martin, & McGrath, 2007) positive symptoms in general, (Spauwen, Krabbendam, Lieb, Wittchen, & van Os, 2006) psychosis in general (Janssen et al. 2004), and non-clinical psychotic experiences. (Lataster et al, 2004)

Unfortunately few studies in this field have analysed their findings separately by gender. A recent New Zealand study that did so (Barker-Collo & Read, 2011) found that for both men and women childhood sexual abuse (with or without childhood physical abuse) was significantly related to the Psychoticism scale on the Symptom Checklist-90 Revised. Furthermore the difference on the Psychoticism scale between non-abused and sexually abused individuals was 3.1 points for females and 10.8 for males.

Further gender-focussed research in this field will be valuable. Although the relationship between adversity (including sexual abuse) and psychosis is clearly not specific to gender, they may well be different pathways to psychosis in general, and perhaps to specific psychotic symptoms. (Read & Beavan, 2013) For example, in the New Zealand study (Barker-Collo & Read, 2011) males who had been sexually

abused not only scored particularly high on Psychoticism but also scored particularly low on the coping style of Seeking Guidance/Support. This may be a partial explanation for why males experiencing psychosis engage less well with services and have worse outcomes. (Theuma, Read, Moskowitz, & Stewart, 2007)

Furthermore although sexual abuse is rarely spontaneously disclosed by either gender, male youths are not only less likely than female youths to spontaneously tell anyone at the time of their abuse but also take longer to do so, or to seek help for the effects of their abuse, as adolescents or adults (O'Leary & Barber, 2008). It is interesting to note, in the current context, that two groups of patients are particularly unlikely to be asked about child abuse: those with a diagnosis of 'schizophrenia', and males (Read, Hammersley, & Rudegeair, 2007). Focus on adversities (including, but not only, sexual abuse) in childhood and adolescence may be useful in understanding the early onset of psychosis in males and the preponderance in males of negative symptoms, cognitive deficits, enlarged ventricles and reduced hippocampal volume (Read & Beavan, 2013). The differential psychological and biological responses of males and females to early trauma may be relevant here (Perry, Pollard, Blakley, Baker, & Vigilante, 1995)

This study had some limitations. First, the assessment of sexual trauma was very general and did not provide any details on the frequency and severity of the sexual trauma, or the age that sexual abuse first occurred. Second, the assessment of psychosis was not clinician based. Third, the temporal ordering of trauma occurrence and the onset of psychotic symptoms cannot be unequivocally established. Finally, the prison population is likely to differ from the general population on a range of psychological variables, and so generalizing beyond this population should be done with caution.

In conclusion, this study used secondary data analysis to test complex psychological hypotheses using data from a large sample of incarcerated prisoners. This afforded us the degree of statistical power that would be unlikely to be achieved using population based surveys. Psychologists and criminologists should be aware of the availability of a plethora of data resources that are freely available. For example, the UK data Archive (<http://www.data-archive.ac.uk/>) hosts data from the annual Crime Survey of England and Wales, and other one-off surveys such as the Experience and Expression in the Fear of Crime Survey and Effects of Long-Term Imprisonment.

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**Table 1.** Results from multi-group (gender) binary logistic regression model predicting probable psychosis.

Predictor	Probable Psychosis	
	Females	Males
	OR (95% CI)	OR (95% CI)
Age	1.10 (0.95 - 1.28)	0.97 (0.88 - 1.07)
Live alone	0.99 (0.55 - 1.74)	2.00 (1.38 - 2.91)
Paid work before prison	0.45 (0.24 - 0.82)	0.69 (0.46 - 1.02)
Any qualification	1.02 (0.62 - 1.66)	0.72 (0.51 - 1.02)
Born in UK	1.48 (0.62 - 3.51)	1.43 (0.70 - 2.91)
Any neurotic disorder	4.51 (2.13 - 9.53)	4.05 (2.61 - 6.29)
AUDIT score > 8	2.03 (1.24 - 3.29)	1.23 (0.86 - 1.75)
Cannabis use	0.68 (0.40 - 1.12)	1.17 (0.79 - 1.74)
Experienced bullying	1.77 (1.05 - 2.96)	1.78 (1.23 - 2.56)
Experienced violence at work	2.80 (1.05 - 7.45)	1.19 (0.69 - 2.05)
Experienced violence in the home	1.00 (0.58 - 1.69)	1.14 (0.79 - 1.66)
Ever been homeless	1.07 (0.64 - 1.77)	1.56 (1.05 - 2.32)
Were you ever taken into Local Authority Care	1.20 (0.70 - 2.05)	1.12 (0.77 - 1.62)
Sexual abuse	2.60 (1.87 - 3.61)*	2.60 (1.87 - 3.61)*

Note: \* parameters constrained to be equal.