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## **Prevalence and correlates of psychotic experiences amongst children of depressed parents**

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## **Abstract**

Psychotic experiences in young people are substantially more common than psychotic disorders, and are associated with distress and functional impairment. Family history of depression as well as of schizophrenia increases risk for psychotic experiences, but the prevalence of such experiences and their clinical relevance in offspring of depressed parents is unknown. Our objectives were to explore i) the prevalence of psychotic experiences amongst offspring of parents with recurrent unipolar depression and ii) the relationship between psychotic experiences and other psychopathology. Data were drawn from the 'Early Prediction of Adolescent Depression' longitudinal study of high-risk offspring (aged 9-17 years at baseline) of 337 parents with recurrent depression. Three assessments were conducted over four years. Psychopathology was assessed using the Child and Adolescent Psychiatric Assessment. Seventy-eight percent of families (n=262) had complete data on psychotic experiences at each of the three time points. During the study, 8.4% (n=22; 95% CI 5.0%, 11.8%) of offspring reported psychotic experiences on at least one occasion, and these were associated with psychiatric disorder, specifically mood and disruptive disorders, and suicidal thoughts/behaviour. Psychotic experiences amongst offspring of depressed parents index a range of psychopathology. Further research is needed to examine their clinical significance and long-term consequences.

## **Key words**

Depression, Psychosis, Child, Adolescent, Parental, Psychopathology

## 1. Introduction

Over recent years, there has been increased interest in psychotic experiences that exist in young people who do not meet diagnostic criteria for a psychotic disorder. Psychotic experiences (hallucinations, delusions and thought disorder) are substantially more common than clinical psychotic disorders in the general population (van Os and Kapur, 2009), particularly in children and adolescents (Kelleher et al, 2012a). They are associated with a wide range of established risk factors for schizophrenia (van Os and Kapur, 2009; Myin-Germeys et al, 2003), and, in some individuals, show persistence over time (Dominguez et al, 2011; Mackie et al, 2011) and progression to impaired function and psychotic disorder (Poulton et al, 2000; Hanssen et al, 2005; Rossler et al, 2007, Welham et al, 2009; Zammit et al, 2013). Psychotic experiences are also associated with mood and other psychiatric disorders (Hanssen et al, 2003; Johns et al, 2004; Nishida et al, 2008, Scott et al, 2009; Yung et al, 2009; Polanczyk et al, 2010; Varghese et al, 2011; Wigman et al, 2011; Kelleher et al, 2012b), and with suicidal behaviour (Kelleher et al, 2012c; Nishida et al, 2010).

Family history of psychosis is a well established risk factor for psychotic experiences in young people (Polanczyk et al, 2010; van Os et al, 2003). Family history of depression has also been suggested as a risk factor (Zammit et al, 2008), meaning offspring of depressed parents are a potentially high risk group. It is well established that children of parents with recurrent depression are at increased risk of a wide range of psychopathology, including depression, anxiety and disruptive behaviour disorders (Weissman et al, 2006; Rice et al, 2002; Mars et al, 2012). However, the meaning of psychotic experiences in this context has received less attention. We are not aware of any cross-generational studies which have examined psychotic experiences in these high-risk offspring. The clinical significance of psychotic experiences in high-risk offspring of parents with a psychiatric disorder other than schizophrenia is in general unknown.

This study examines psychotic experiences in a longitudinal sample of the offspring of parents with recurrent depression. Psychotic experiences were assessed using well-established semi-structured research diagnostic interviews, giving high-quality ascertainment of experiences and symptoms. The study aims to explore i) the prevalence of psychotic experiences in the offspring of parents with recurrent depressive disorder, and ii) their relationship with other psychopathology.

## **2. Methods**

### 2.1. Sample information

This study used data from the 'Early Prediction of Adolescent Depression' (EPAD) study, a three-wave longitudinal study of the offspring of recurrently depressed parents. At baseline, participants included 337 parents, all of whom had a history of recurrent unipolar depression (315 mothers, 22 fathers, age 26-55 years, mean 41.7 years) and their offspring (197 females, 140 males, age 9-17 years, mean 12.4 years). The sample was recruited predominantly from general practices across South Wales (78%). Additional participants were sourced from a database of individuals with previously identified unipolar depression (19%) and community volunteers (3%). Further details of sample recruitment and assessments have been reported elsewhere (Mars et al, 2012).

Parents had a history of recurrent unipolar depression (at least 2 episodes during their lifetime; later confirmed at interview). Parents with a lifetime diagnosis of bipolar or psychotic disorder and those who met DSM-IV criteria for mania/hypomania at the time of interview were excluded from the study (although parents were still eligible if they had manic/hypomanic or psychotic experiences without a disorder). There were no diagnostic exclusion criteria for the child, although children were required to have an IQ  $\geq$  50 (assessed using the Wechsler Intelligence test for children, 4<sup>th</sup> UK Edition, WISC-IV (Wechsler et al, 2003)). Only one child from each family was selected to participate. In those families where there was more than one child present in the household, the youngest eligible child (aged 9-17 years) was selected. There were no children in the study with a psychotic disorder such as schizophrenia.

Data were collected at three time points. The average time between baseline assessment and first follow-up was 16 months (SD 2.69) and between the first and second follow-up was 13 months (SD 1.56). Two families were excluded from the study at follow-up as the affected parent received a clinician diagnosis of bipolar affective disorder.

Sample retention across the study was good (figure 1) with full interview data available on 86% of families (n=288) at time 2 and 85% of families (n=283) at time 3. Seventy-nine percent of families (n=262) had interview data at all three time points of the study and had complete data on psychotic experiences. Families with complete interview data did not differ from families who declined to participate at follow-up with regards to baseline child psychotic experiences  $\chi^2(1, N=316) = .014, P = .906$ .

## 2.2. Procedure

The Multi-centre Research Ethics Committee for Wales reviewed and approved the study protocol. At each assessment, parents and children were provided with a description of the study and written informed consent from parent and child was obtained. Data were collected from parents and children via established semi-structured research diagnostic interviews. Assessments were conducted by pairs of trained interviewers, all of whom were psychology graduates and were supervised weekly by a team of clinical child and adolescent and adult psychiatrists. Parents and children also completed questionnaire packs assessing a variety of demographic, health, and social characteristics. These were sent to the household two weeks prior to each interview.

## 2.3. Measures

*2.3.1. Child and Adolescent Psychiatric Assessment (CAPA), parent and child versions (Angold and Costello, 2000):*

The Child and Adolescent Psychiatric Assessment is a well-established semi-structured research diagnostic interview which was administered to parents and children at each time point to assess children's mood disorders (major depressive disorder, dysthymia, depressive disorder not otherwise specified, bipolar disorder and cyclothymia), anxiety disorders (separation anxiety disorder, generalised anxiety disorder, obsessive compulsive disorder, social anxiety disorder, panic disorder,

agoraphobia and anxiety disorder not otherwise specified), disruptive behaviour disorders (oppositional defiant disorder, conduct disorder and disruptive behaviour disorder not otherwise specified) and ADHD (parent only) based on symptoms and impairment present in children and adolescents during the preceding three months. The CAPA can be used to generate both dimensional symptom counts and psychiatric diagnoses according to DSM-IV and ICD-10 criteria. For DSM-IV psychiatric diagnosis, parent and child reports were combined at the diagnostic level (a diagnosis was considered present if criteria was reached on either the parent or the child interview). All cases meeting criteria for diagnosis and all those with sub-threshold symptoms were reviewed by two child psychiatrists (RP and AT) and diagnoses were agreed by clinical consensus. Reports of psychiatric disorder were combined across the three waves of the study to produce a composite variable for each disorder type.

Child psychotic experiences were assessed using the psychosis section of the CAPA, which includes questions related to perceptual distortions (changed perception, changed perception of time, depersonalisation and derealisation) and hallucinations; delusions and delusional interpretations; psychotic abnormalities of thought or speech and idiosyncratic behaviour. In the current study, perceptual distortions and idiosyncratic behaviour were excluded so as to focus only on core psychotic experiences (WHO, 1994), however additional sensitivity analysis including these experiences (that we will refer to as 'psychotic and unusual experiences') was also conducted. For psychotic experiences, parent and child reports were combined (an experience was considered present if reported by either the parent or the child). The threshold for psychotic experience definitions in CAPA are more stringent compared with questionnaire measures, and each reported psychotic experience was reviewed by a team of two child psychiatrists before being rated as present (see supplementary figure).



Suicidal thoughts and behaviors were assessed using the suicide section of the CAPA. Reports were combined across the three waves of the study, as for psychiatric disorder (Hammerton et al, 2015).

### *2.3.2. Demographic and other variables:*

The following variables were examined for association with psychotic experiences: child age, gender, IQ score measured at baseline using the WISC-IV (Wechsler et al, 2003), parental income (dichotomized at baseline according to the sample median of £30,000), family history of psychotic disorder (the number of the child's first degree relatives affected, assessed at baseline using a count based method (Milne et al., 2008)), lifetime history of parent psychotic experiences during the study (delusions or hallucinations, assessed at baseline using a symptom checklist, presence/absence was reviewed and agreed upon by an adult psychiatrist), and parent depression severity (assessed for the parent's worst ever depressive episode using the Global Assessment of Functioning (GAF) scale (American Psychiatric Association, 1994)).

### 2.4. Statistical analysis

The percentage of offspring with any reported psychotic experience during the study, and at each of the three time points was calculated. Associations were investigated between offspring psychotic experiences reported at any time point during the study and possible correlates (child age, gender, and IQ score, parental income, family history of psychotic disorder, parent psychotic experiences and parent depression severity).

The relationship between child psychotic experiences occurring over the study and psychiatric disorder (any DSM-IV disorder, mood disorders, anxiety disorders, ADHD and disruptive behaviour disorders), and suicidal thoughts/behaviour were then investigated. Secondary analyses also examined cross-sectional associations between psychotic experiences and any psychiatric disorder separately at each of the three time points.

All associations were investigated using univariable logistic regression analyses, and were performed using Stata (version 11, Stata Corp LP, College Station, TX, USA).

### **3. Results**

#### 3.1. Prevalence of psychotic experiences across the study

Nine out of 327 high-risk children (2.8%, 95% CI = 1.0%, 4.5%) reported psychotic experiences at baseline, ten out of 287 children (3.5%, 95% CI 1.4%, 5.6%) reported psychotic experiences at time 2 and nine out of 283 (3.2%, 95% CI = 1.1%, 5.2%) at time 3. Of the subset of children with complete data on psychotic symptoms at all three time points (n=262), 22 (8.4%, 95% CI = 5.0%, 11.8%) reported psychotic experiences at some point during the study. Of those 22 individuals, 21 reported hallucinations and one individual reported a delusion. Eight individuals experienced visual hallucinations, seven experienced auditory hallucinations and six experienced olfactory hallucinations. No psychotic abnormalities of thought or speech (as defined in the CAPA) were reported (Angold and Costello, 2000).

There was weak evidence that males were more likely to report psychotic experiences than females (OR = 2.21, 95% CI = 0.91, 5.36, P = .081), with the confidence intervals including the null (Table 1). There was little evidence of an association between psychotic experiences and child age, mean IQ, income, family history of psychotic disorder, lifetime parent psychotic experiences, or parent depression severity.

#### 3.2. Associations between psychotic experiences, psychiatric disorders and suicidal thoughts/behaviours

Psychotic experiences in the offspring were associated with child psychiatric disorder (Table 2) (OR = 2.54, 95% CI = 1.04, 6.18, P = .040). Of those 22 children and adolescents who reported psychotic

experiences during the study, 59% (n=13) met DSM-IV criteria for a psychiatric disorder, compared with 36% (n=87) of those who did not report psychotic experiences. A similar pattern of results was found cross-sectionally at each of the three time points (Supplementary table).

Psychotic experiences in the offspring were associated with mood disorders (OR = 2.64, 95% CI = 1.01, 6.94, P = .048) and disruptive behaviour disorders (OR = 3.71, 95% CI = 1.44, 9.56, P = .007). There was little evidence of an association with anxiety disorder (OR = 1.92, 95% CI = 0.77, 4.82, P = .164) or ADHD (OR = 2.55, 95% CI = 0.67, 9.66, P = .169), although these disorders were more common amongst those with psychotic experiences compared to those without (anxiety disorders 36% vs. 23%; ADHD 14% vs. 6%). There was weak evidence of an association between psychotic experiences and suicidal thoughts/behaviours (OR = 2.64, 95% CI = 0.89, 7.78, P = .079), with the confidence intervals including the null.

Nineteen of the 22 individuals with psychotic experiences (86.4%) reported such experiences at only one time point and three individuals (13.6%) at two time points. All three individuals with persistent psychotic experiences (i.e. those who reported psychotic experiences at more than one time point) were diagnosed with a psychiatric disorder during the study, compared to 10 (52.6%) of those who had psychotic experiences at only one time point.

Reporting psychotic experiences in the context of a psychiatric disorder was strongly associated with a comorbid psychiatric disorder (OR = 5.78, 95% CI = 2.35, 14.22, P <.001) and comorbid suicidal thoughts/behaviour (OR = 5.24, 95% CI = 2.69, 10.26, P <.001) with over a five-fold increase in odds compared to those with disorder alone.

### 3.3. Sensitivity analysis – broader outcome of psychotic and unusual experiences

Broadening the definition of our outcome to include the unusual, but non-psychotic experiences assessed by the CAPA resulted in an extra 10 cases. These were all experiences of depersonalisation or derealisation. Of the subset with complete data at all 3 time points (n=262), a total of 32 (12.2%, 95% CI 8.2%, 16.2%) reported psychotic or unusual experiences at any time point. There was a similar pattern of results to the primary analysis with regards to demographics (available on request), any psychiatric disorder (OR = 3.65, 95% CI = 1.68, 7.95, P = .001), mood disorder (OR = 3.85, 95% CI = 1.71, 8.65, P = .001) and suicidal thoughts/behaviour (OR = 3.30, 95% CI = 1.32, 8.26, P = .011). Using the broader definition, psychotic and unusual experiences were also associated with anxiety disorders (OR = 3.35, 95% CI = 1.56, 7.18, P = .002). However, in contrast with the primary analyses, there was little evidence for differences in disruptive behaviour disorders (OR = 2.06, 95% CI = .85, 4.99, P = .108).

#### **4. Discussion**

The present study assessed psychotic experiences amongst a sample of high-risk children of parents with recurrent depression. Psychotic experiences were found to be associated with psychiatric disorder, specifically mood and disruptive disorders, and also suicidal thoughts/behaviours. Approximately 3% of the children in the sample described psychotic experiences at each time point, with 8.4% reporting psychotic experiences at some point over the course of the study. This is compatible with the median prevalence of psychotic experiences of 7.5% found in a recent meta-analysis of adolescent (aged 13-18) population studies (Kelleher et al, 2012a), and the prevalence of 7.2% reported in another meta-analysis of children and adults in the general population (Linscott and van Os, 2013). However, psychotic experiences in the present sample were stringently defined as they were assessed using a semi-structured diagnostic interview with a high threshold for symptom definition and reviewed by two experienced child psychiatrists. This would almost certainly have led to lower estimates of core psychotic experiences (hallucinations and delusions) than if we had used a questionnaire measure or structured interview, as used by most studies included in those reviews.

All but one of the core psychotic experiences were hallucinations, which might suggest that such experiences are more common in this group of young people than other psychotic experiences such as delusions. There was low stability in the experiences over time with only three children (14% of those with psychotic experiences) reporting psychotic experiences at more than one time point. Results suggested that individuals with persistent psychotic experiences are more likely to have psychiatric disorder, compared to those with transient psychotic experiences. However, the low numbers in this study precluded statistical analysis, and so these findings need to be interpreted with caution. It would be interesting to investigate further the clinical significance of persistent versus transient psychotic experiences in a larger sample of children at high-risk.

Psychotic experiences in offspring were associated with psychiatric disorders, specifically mood and disruptive disorders. There was also an association with anxiety disorders when broadening our measure of psychotic experiences to include depersonalisation and derealisation, which might suggest that such experiences are more strongly associated with anxiety than representing core psychotic experiences. Further research is needed to explore the difference in the clinical significance of psychotic experiences compared to experiences such as derealisation or depersonalisation, for example in predicting suicidal thoughts/behaviour, in follow-up studies.

The association between psychotic experiences and psychiatric disorders other than schizophrenia has been shown in previous studies of general population and high-risk groups (Hanssen et al, 2003; Johns et al, 2004; Nishida et al, 2008, Scott et al, 2009; Yung et al, 2009; Polanczyk et al, 2010; Varghese et al, 2011; Wigman et al, 2011; Kelleher et al, 2012b). Moreover, our findings are also consistent with studies suggesting an association between psychotic experiences and suicidal behavior in the general adolescent population and amongst adolescents with depressive disorder (Kelleher et al, 2012c; Sullivan et al, 2015). Although we found strong associations with psychiatric disorder, 41% of those with psychotic experiences did not have a disorder, and it would be interesting to follow-up these individuals in the future to determine the likely clinical relevance of their psychotic experiences.

We did not find an association between age and psychotic experiences in this study (children were aged 9-17 at baseline). Two previous studies (Kelleher et al, 2012b; Zammit et al, 2013) found that the prevalence of psychotic experiences was lower in older compared to younger adolescents, and one study reported a greater association with psychiatric disorder in older adolescents (Kelleher et al, 2012b). Larger longitudinal studies are needed to examine the clinical significance of psychotic experiences according to age.

The present study extends previous findings by demonstrating associations amongst the offspring of depressed parents, a sample considered to be at high-risk of psychopathology (Mars et al, 2012), but

for whom psychotic experiences have not previously been examined. It has been suggested that disorders such as depression are more severe when psychosis is present (Kelleher et al, 2012b; WHO, 1994; Garralda, 1984), and there is some evidence that psychotic experiences index more severe depressive psychopathology in general population samples (Stochl et al, 2015). In the present study, children with a psychiatric disorder who had psychotic experiences were much more likely to have additional comorbid disorders and suicidal thoughts/behaviours compared to children with a psychiatric disorder without psychotic experiences. This suggests that clinicians should ask about psychotic experiences in young people with psychiatric disorder, to ensure an appropriately broad assessment and treatment.

#### 4.1. Strengths and weaknesses

This is currently the largest longitudinal family study of parents with recurrent depressive disorder. This study comprehensively assessed families on three occasions over four years using multiple informants and assessments of child psychotic experiences and psychopathology derived from a standardised diagnostic interview. Most existing studies are based on self-report questionnaires which can be misinterpreted and lead to inflated numbers of psychotic experiences (Kelleher et al, 2011; Horwood et al, 2008). There was also a low attrition rate for a sample of this nature and considering the length of follow-up.

However, results must also be interpreted in light of several limitations. First, the number of children in the sample with psychotic experiences was small, and estimates were imprecise with wide confidence intervals. However, symptoms were established rigorously and reviewed by two psychiatrists. Our findings require replication in a larger sample.

Secondly, whilst this was a longitudinal sample, it was not possible to look at temporal associations, given there were so few reported psychotic experiences. Further research is needed to determine the direction of effects, and to understand the clinical relevance of such experiences and their predictive value for psychiatric disorder and impairment in this group.

Thirdly, psychotic experiences were assessed in offspring of parents with recurrent depression who are known to be at increased risk of psychopathology, however we were unable to determine whether risk of psychotic experiences was elevated in this group relative to the general population. To investigate this would require a control group of children with no parental history of depression, using the same methodology.

Fourthly, the analysis is based on data at three time points, and the CAPA identified psychopathology in the previous three months. It is possible that some psychotic experiences may have been missed and therefore prevalence may be underestimated. We found 59% of adolescents with psychotic experiences had a psychiatric disorder in this study. However, individuals in the sample have not passed through age of risk for development of psychopathology such as bipolar disorder and schizophrenia, and may go on to develop psychiatric disorder in the future (Fisher et al, 2013). There were also some psychiatric disorders, such as PTSD that were not assessed. Finally, the majority of parents in our sample were mothers recruited from primary care, and caution is required in generalising findings to children of depressed fathers.

#### 4.2. Conclusions

The findings of this study suggest that psychotic experiences in offspring of parents with recurrent depression are not common, but may be an important indicator of accompanying psychopathology, specifically mood and disruptive disorders and suicidal thoughts/behaviors. Further research is needed in large longitudinal samples to examine the long term consequences of psychotic experiences in young people, particularly in high risk groups.



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## **Contributors**

Analysis of study data: RBJ, BM; Interpretation of study data: RBJ, BM, AT, SZ; Draft the output: RBJ; Critique the output for important intellectual content: RBJ, BM, SC, RP, AKT, NC, AT, SZ. All authors have read and approved the final version of the manuscript.

## **Ethical standards**

The study was approved by the Multi-Centre Research Ethics Committee for Wales. All persons gave their informed consent prior to their inclusion in the study. The authors declare that they have no conflict of interest.

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**Table 1:****Demographic and other correlates of psychotic experiences over the study**

	Child psychotic experiences at any time point <sup>a</sup>			
	Yes (22)	No (240)	OR (95% CI)	P
Child age years at T1, mean (SD)	12.36 (2.13)	12.35 (2.04)	1.00 (.81, 1.24)	.983
Male gender, n (%)	13 (59%)	95 (40%)	2.21 (.91, 5.36)	.081
IQ, mean (SD)	95.64 (10.38)	101.16 (61.57)	.99 (.96, 1.03)	.590
Below median income at T1 (< £30,000), n (%)	13 (59%)	113 (49%)	1.48 (.61, 3.61)	.385
Family history of psychotic disorder <sup>b</sup> , n (%)	0 (0%)	9 (4%)	-	-
Lifetime parent psychotic experiences <sup>b</sup> , n (%)	3 (14%)	14 (6%)	2.52 (.66, 9.53)	.175
Parent depression severity, mean GAF score for worst episode <sup>c</sup> (SD)	37.00 (14.05)	42.50 (17.79)	.98 (.96, 1.01)	.161

<sup>a</sup> Numbers vary due to missing data

<sup>b</sup> Parents with a psychotic or bipolar diagnosis, and those who met DSM-IV criteria for mania/hypomania were excluded from the study

<sup>c</sup> GAF refers to the Global Assessment of Functioning Scale, lower scores indicate greater impairment

**Table 2:****Associations between DSM-IV child psychiatric disorder, suicidal thoughts/behaviour and psychotic experiences over the study**

Child psychotic experiences at any time point <sup>a</sup>				
	Yes (22)	No (240)	OR (95% CI)	P
Any DSM-IV Disorder <sup>b</sup>	13 (59%)	87 (36%)	2.54 (1.04, 6.18)	.040
Any Mood Disorder	7 (32%)	36 (15%)	2.64 (1.01, 6.94)	.048
Any Anxiety Disorder	8 (36%)	55 (23%)	1.92 (.77, 4.82)	.164
ADHD	3 (14%)	14 (6%)	2.55 (.67, 9.66)	.169
Any Disruptive Behaviour Disorder	8 (36%)	32 (13%)	3.71 (1.44, 9.56)	.007
Suicidal thoughts/behaviour	5 (23%)	24 (10%)	2.64 (.89, 7.78)	.079

<sup>a</sup> Numbers vary due to missing data

<sup>b</sup> Mood disorders include major depressive disorder, dysthymia, depression not otherwise specified, bipolar disorder and cyclothymia. Anxiety disorders include generalised anxiety disorder, separation anxiety, social phobia, panic disorder, agoraphobia, obsessional compulsive disorder and anxiety disorder not otherwise specified. Disruptive behaviour disorder includes oppositional defiant disorder, conduct disorder and disruptive behaviour not otherwise specified.



**Figure 1: Flow chart showing sample retention**



