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Title: Psychotic experiences in the population: association with functioning and mental distress

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Abstract

Psychotic experiences are far more common in the population than psychotic disorder. They are associated with a number of adverse outcomes but there has been little research on associations with functioning and distress. We wished to investigate functioning and distress in a community sample of adolescents with psychotic experiences. Two hundred and twelve school-going adolescents were assessed for psychotic experiences, mental distress associated with these experiences, global (social/occupational) functioning on the Children's Global Assessment Scale, and a number of candidate mediator variables, including psychopathology, suicidality, trauma (physical and sexual abuse and exposure to domestic violence) and neurocognitive functioning. Seventy five percent of participants who reported psychotic experiences reported that they found these experiences distressing (mean score for severity of distress was 6.9 out of maximum 10). Participants who reported psychotic experiences had poorer functioning than participants who did not report psychotic experiences (respective means: 68.6, 81.9; OR=0.25, 95% CI=0.14-0.44). Similarly, participants with an Axis-1 psychiatric disorder who reported psychotic experiences had poorer functioning than participants with a disorder who did not report psychotic experiences (respective means: 61.8, 74.5; OR=0.28, 95% CI=0.12-0.63). Candidate mediator variables explained some but not all of the relationship between psychotic experiences and functioning (OR=0.48, 95%CI=0.22-1.05, p<0.07). Young people with psychotic experiences have poorer global functioning than those who do not, even when compared with other young people with psychopathology (but who do not report psychotic experiences). A disclosure of psychotic experiences should alert treating clinicians that the individual may have significantly more functional disability than suggested by the psychopathological diagnosis alone.

Key words: Psychosis, psychotic experiences, global functioning, distress

Introduction

Psychotic experiences are far more common in the population than psychotic disorder (Cullen et al., 2014; Devylder et al., 2013; Laurens et al., 2012; Lin et al., 2011; Saha et al., 2011a). Among young people, these experiences most commonly occur in the form of auditory hallucinations, which may be frankly psychotic in nature or, more commonly, attenuated (that is, hallucinatory experiences with intact reality testing) (Kelleher et al., 2011). Psychotic experiences have been found to be important from a number of clinical perspectives. In addition to a relatively increased risk for psychosis (Fisher et al., 2013; Kaymaz et al., 2012; Poulton et al., 2000; Welham et al., 2009), young people with psychotic experiences are at high risk for a range of psychopathological diagnoses (Barragan et al., 2011; Downs et al., 2013; Scott et al., 2009; Werbeloff et al., 2012; Wigman et al., 2012a; Yung et al., 2009). We recently demonstrated in multiple independent samples that the majority of community-based adolescents who reported psychotic experiences met criteria for at least one (non-psychotic) DSM-IV Axis-1 psychiatric disorder (Kelleher et al., 2012b). Similarly, results from the Dunedin longitudinal study showed that the majority of young people who reported psychotic experiences at age 11 had a DSM IV Axis-1 psychiatric disorder at age 38 (Fisher et al., 2013). While there has been some research on functioning in individuals at 'clinical high risk' for psychosis (Carrion et al., 2011; Corcoran et al., 2011; Grano et al., 2011), there has been little research to date on global functioning in community samples who report psychotic experiences. Therefore, we wished to investigate the relationship between psychotic experiences and functioning in a general population sample of adolescents.

At a mechanistic level, there are a number of factors that might contribute to poorer functioning in individuals with psychotic experiences. Aside from an overall increased risk of having a diagnosable mental disorder, psychotic experiences are a strong marker of risk for multimorbidity (that is, the presence of more than one disorder), with the prevalence of psychotic experiences increasing in a dose-response manner with the number of diagnosable disorders (Kelleher et al., 2012b), a finding

that has been replicated in clinical (Kelleher et al., 2013b) and heterogeneous population samples (DeVylder et al., 2014). What is more, suicidality is highly prevalent among individuals with psychopathology who report psychotic experiences, even compared to individuals with the same diagnoses (but who do not report psychotic experiences) (Kelleher et al., 2014; Kelleher et al., 2012c). Neurocognitive deficits have been reported in individuals with psychotic experiences, most notably in processing speed (Barnett et al., 2012; Blanchard et al., 2010; Cullen et al., 2010; Kelleher et al., 2012a), a domain that has previously been highlighted as important more generally in terms of social/role functioning (Carrion et al., 2011). Furthermore, individuals with psychotic experiences have been shown to have significantly more exposure to childhood trauma (Arseneault et al., 2011; Fisher et al., 2012; Freeman and Fowler, 2009; Galletly et al., 2011; Janssen et al., 2004; Kelleher et al., 2013c; Saha et al., 2011b; Scott et al., 2007; Wigman et al., 2012b), something that might also contribute to long term dysfunction.

We also wished to investigate the relationship between psychotic experiences and subjective mental distress. Whilst young people who report psychotic experiences are at increased risk for a range of distressing outcomes (Yung et al., 2006), there has been little research to examine whether psychotic experiences are, in themselves, distressing to the young people who experience them. Notably, Armando et al found a strong correlation between the frequency of psychotic experiences in a population sample and reported levels of distress (Armando et al., 2010). However, their methodology did not allow them to report the proportion of individuals with psychotic experiences who were distressed by them, nor whether this distress impacted on overall functioning. Therefore, we also investigated what proportion of young people in the population reported feeling distressed by their psychotic experiences and whether distress was related to overall functioning.

Specifically, our hypotheses were:

(i) Individuals with psychotic experiences would have poorer global functioning than individuals without psychotic experiences.

(ii) Individuals with psychopathology who reported psychotic experiences would have poorer global functioning than individuals with psychopathology who did not report psychotic experiences.

(iii) Multimorbid psychopathology, suicidality, neurocognitive dysfunction and trauma exposure would at least partly explain the relationship between psychotic experiences and poorer global functioning.

(iv) Psychotic experiences would be distressing for the majority of individuals.

(v) The level of distress associated with psychotic experiences would be inversely related to global functioning.

Method

Recruitment

The study was carried out in Dublin, Ireland and neighbouring counties, with testing conducted over three consecutive years during school summer breaks. The study methodology has been previously reported (Kelleher et al., 2012b). However, briefly, a total of 1131 pupils from 16 schools in 5th and 6th class (that is, the two most senior years in the Irish national/primary school system), aged 11 to 13 years, participated in a survey of psychiatric symptoms, using the Strengths and Difficulties Questionnaire (SDQ) (Goodman et al., 2000), which is a validated self-report instrument that assesses emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behaviour. This sample was also assessed for psychotic experiences, using the Adolescent Psychotic Symptom Screener (APSS), which is a validated self-report instrument that assesses hallucinations and delusions (Kelleher et al., 2011). These instruments were completed in school, with a member of the research team present in the classroom. Data from these instruments were not used as part of a selection process; rather, these instruments provided baseline data on psychopathology and psychotic experiences in the total school-based population. Written informed consent was obtained from the parent or guardian of participants. Of the total 1131 adolescents, 656 indicated an interest in taking part in a more in depth study and a random sample of 212 were brought for clinical interview and neurocognitive testing. Among the first 20% of the sample who attended for interview we enriched at a rate of 2:1 for adolescents with a score of 2 or more on the Adolescent Psychotic Symptom Screener (APSS). For the majority (80%), however, the sample was a random sample representative of the overall larger surveyed sample. A frequency weight was applied in STATA for the statistical analyses to account for enrichment at a rate of 2:1 in the first 20% of interviewed participants. All percentages reported are based on the weighted prevalence.

Assessment of psychotic experiences

Psychotic experiences were assessed using a modified version of the Psychosis section of the Schedule for Affective Disorders and Schizophrenia for School-aged Children (K-SADS) (Kaufman et al., 1996). The K-SADS is a well-validated semi-structured research diagnostic interview for the assessment of Axis-1 psychiatric disorders in children and adolescents. The psychosis section contains questions designed to assess a range of hallucinations and delusional thinking. Children and parents were interviewed separately, both answering the same questions about the child. Interviews were conducted by two psychiatrists and four psychologists with extensive training on the assessment of psychotic experiences. All interviewers recorded detailed notes of potential psychotic phenomena in this section of the interview. On completion of the interview stage of the study, a clinical consensus meeting was held in which two of the investigators (IK and MC) were presented with information on all potential psychotic experiences and rated these experiences as psychotic in nature or not. The investigators were blind to all other information regarding the participants.

Assessment of functioning and distress

Functioning was assessed using the Children's Global Assessment Scale (CGAS), which is a validated measure of global functioning adapted from the Global Assessment Scale for Adults (Shaffer et al., 1983). The CGAS is divided into ten levels, with the lowest (scored between 1 and 10) indicating very severe impairment ('needs 24-hour care/supervision') and the highest (scored 91 to 100) indicating a very healthy level of functioning ('superior functioning in all areas'). With regard to distress, participants were asked the following question: "When you experienced [reported experience], did you find it distressing or did it not bother you"? Participants who reported that they were distressed by their experience were then asked to rate their level of distress on an analogue scale from 1 to 10, where 0 was 'not worried at all' and 10 was 'the most distressed you could ever possibly be'. Where

more than one psychotic experience was reported, participants were asked to rate the most distressing of their experiences.

Assessment of psychiatric disorders

The Schedule for Affective Disorders and Schizophrenia for School-aged Children, Present and Lifetime versions (K-SADS) was used to assess for psychopathology (Kaufman et al., 1996). The K-SADS is a validated semi-structured research diagnostic interview for the assessment of all Axis-1 psychiatric disorders in children and adolescents. Adolescents and parents were interviewed separately, both answering the same questions about the child.

Assessment of suicidality

Suicidality refers to a continuum from suicidal ideation to suicide plans to suicide acts (Nock et al., 2008). Suicidality was assessed as part of the K-SADS interview. The suicidality section begins with the interviewer asking about whether the individual has ever experienced recurrent thoughts of death, before moving on to ask a series of questions to assess suicidal ideation, suicide plans and suicide attempt. A history of suicidality was endorsed if the participant reported suicidal ideation, suicide plans and/or a suicide attempt.

Assessment of childhood trauma

Three types of childhood trauma that have been demonstrated in young people with psychotic experiences and which were assessed in the current study were physical abuse, sexual abuse and exposure to domestic violence. These were assessed as part of the K-SADS interview. In relation to physical abuse, participants were asked the following questions: "*When your parents got mad at you, did they hit you? Have you ever been hit so that you had bruises or marks on your body, or were hurt in*

some way? What happened?" In relation to sexual abuse, participants were asked the following questions: "*Did anyone ever touch you in your private parts when they shouldn't have? What happened? Has someone ever touched you in a way that made you feel bad?"* In relation to domestic violence, participants were asked the following question: "*Some kids' parents have a lot of nasty fights. They call each other bad names, throw things, and threaten to do bad things to each other. Did your parents ever get in really bad fights? Tell me about the worst fight you remember your parents having. What happened?"* Parents were asked the same questions, appropriately modified. Participants who had experienced physical or sexual abuse or who were exposed to domestic violence constituted our childhood trauma sample.

Assessment of neurocognition

Neurocognition was assessed using the Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS) battery (Nuechterlein et al., 2008). We previously demonstrated deficits in tasks assessing processing speed and spatial working memory in this sample in participants who reported psychotic experiences (Kelleher et al., 2012a). Therefore, we included these measures in our multivariate analysis. The specific tests were as follows.

Trail making test- Parts A and B (TMT): pencil and paper task which requires the participant to draw a line connecting, in consecutive order, numbers arranged randomly on a page (Part A), followed by both numbers and letters arranged randomly on a page (Part B); outcome: total time for completion. Putative cognitive domain: processing speed.

Brief Assessment of Cognition in Schizophrenia-Symbol coding (BACS-SC): a pencil and paper task which requires participants to write numbers that correspond to nonsense symbols as rapidly as

possible in 90 seconds; outcome: number of symbols coded correctly. Putative cognitive domain: processing speed

Wechsler Memory Scale-Spatial Span (WMS-SS) (non-verbal memory): requires participants to remember and repeat which of a series of blocks the test administrator points to, first forward then backward; outcome: sum of raw scores for both conditions. Putative cognitive domain: working memory (non-verbal).

Statistical analyses

Ordered logistic regression was used to investigate the relationship between psychotic experiences and functioning (score on the CGAS). First, univariate analyses were performed to look at the relationship between CGAS score and psychotic experiences. Univariate analyses were also performed to look at the relationship between CGAS score and psychopathology (number of diagnosable disorders), suicidality, childhood trauma and neurocognitive scores on each of the above tasks. Next, we performed a multivariate analysis (one dependent variable with multiple predictor variables), putting all variables into the model in order to investigate if these variables might account for a relationship between psychotic experiences and functioning. The purpose of the multivariate model was to demonstrate effects of psychotic experiences on functioning excluding the effects of the candidate variables (non-psychotic psychopathology, suicidality, neurocognition and childhood trauma). The model did not assume directionality or causality; rather, the purpose of the model was to examine whether a number of candidate variables might mechanistically account for the relationship between psychotic experiences and functioning. Next, we used logistic regression to look at the relationship between distress associated with psychotic experiences and CGAS score. It was not possible to include the distress variable in the multivariate analyses because, unlike the other variables, distress applied only to those with psychotic experiences (i.e., only those who reported

psychotic experiences could be asked about their distress in relation to these experiences so there was no control group for comparison). We report odds ratios, 95% confidence intervals and p values.

Results

The mean CGAS score for the total sample was 79 (out of a maximum of 100). There was no relationship between CGAS score and sex or socio-economic status. Sixteen participants had a history of suicidal behaviour (11 individuals with suicidal ideation alone and 5 individuals with suicide plans, 1 of whom had made a suicide attempt). Ten participants had a history of childhood trauma. Seventy three participants had a lifetime diagnosable affective, anxiety or behavioural disorder. The lifetime disorders included depressive disorders, including major depressive disorder and adjustment disorder with depressed mood (15%); behavioural disorders, including attention deficit/hyperactivity disorder, oppositional defiant disorder and conduct disorder (9%); and anxiety disorders, including generalised anxiety disorder, social phobia, separation anxiety disorder and obsessive–compulsive disorder (14%) (for further details see (Kelleher et al., 2012b)). Fifty three participants reported psychotic experiences (none had a diagnosable psychotic disorder) and 57% of this group had a history of at least one non-psychotic Axis-1 diagnosis. By comparison, 31% of the sample who did not report psychotic experiences had a history of at least one non-psychotic Axis-1 diagnosis.

Participants who reported psychotic experiences had poorer functioning than participants who did not report psychotic experiences (respective means: 68.6, 81.9; OR=0.25, 95% CI=0.14-0.44, P<0.001; see Table 1). Similarly, participants with an Axis-1 disorder who reported psychotic experiences had poorer functioning than participants with an Axis-1 disorder who did not report psychotic experiences (respective means: 61.8, 74.5; OR=0.28, 95% CI=0.12-0.63, p=0.002; see Table 1).

In univariate analyses, all candidate mediator variables were associated with poorer functioning (see Table 2). When we conducted a multivariate analysis, including all of the candidate variables in the model, functioning was significantly related to psychopathology (number of disorders), suicidal

behaviour, childhood trauma, and performance on Trails B and working memory (but not performance on Trails A or BACS symbol coding). When we included psychotic experiences in the multivariate model with all of the significant candidate mediator variables, in order to determine if all of the relationship between psychotic experiences and functioning was explained by these variables, there was still evidence of an effect of psychotic experiences on functioning (OR=0.48, 95%CI=0.22-1.05, p=0.066), demonstrating that some but not all of the effect was explained by these variables (that is, suggesting that these variables may be partially account, at a mechanistic level, for the clinical relationship between psychotic experiences and poor functioning but that they do not fully explain this relationship).

Seventy five percent of participants (n=40) who reported psychotic experiences reported that they found these experiences distressing. In terms of the severity of distress, the mean self-report score on the analogue scale (out of a maximum of 10) for participants who reported being distressed by their experiences was 6.9 (range 3 to 10). There was no relationship between the severity of distress and functioning (OR=1.04, CI95%=0.87-1.23, p=0.68).

Discussion

In a community sample of adolescents, we found a strong relationship between psychotic experiences and global functioning. Young people with psychiatric disorders who reported psychotic experiences scored, on average, more than 10 points lower on the functioning assessment scale than adolescents with psychiatric disorders who did not report psychotic experiences. This indicates that young people with psychopathology who report psychotic experiences are likely to be significantly more functionally impaired than young people with psychopathology who do not report psychotic experiences. Multivariate analyses suggested that a number of variables may contribute to the poorer functioning in this group. First, those with psychopathology who reported psychotic experiences had more disorders (i.e., more multimorbidity) than those with psychopathology who did not report psychotic experiences. Second, suicidal behaviour was more prevalent among those who reported psychotic experiences. Third, there was more exposure to childhood trauma (physical and sexual abuse and domestic violence) in those who reported psychotic experiences. Fourth, participants with psychotic experiences had poorer neurocognitive performance in measures of processing speed and working memory. When these variables were entered into a multivariate model, the relationship between psychotic experiences and global functioning was attenuated, suggesting that these variables may be partially responsible for the relationship with poorer functioning in individuals with psychotic experiences. Even in the multivariate model, however, there was still a relationship between psychotic

experiences and functioning ($p<0.07$), which suggests that these variables are part of the explanation for the relationship between psychotic experiences and poor functioning but are not the full story.

The vast majority (75%) of participants with psychotic experiences reported that these experiences were distressing. When asked to rate the severity of distress caused by these experiences on an analogue scale from 1 to 10, the mean rating was 6.9, indicating a high degree of distress. However, there was no relationship between level of distress and functional impairment. This might suggest that psychotic experiences, in and of themselves, do not directly cause notable functional impairment. That is, although distress associated with psychotic experiences might be associated with transient functional impairment, distress does not cause a persistent functional impairment. Rather, psychotic experiences appear to be a clinical marker of functional impairment that is directly caused by other factors. This contradicts suggestions that distress may mediate the relationship between psychotic experiences and poor outcomes (Broome et al., 2005). However, it should be noted that our data are cross sectional and we cannot preclude the possibility that distress associated with psychotic experiences would predict poorer functioning later in life.

The multivariate model used in the current study allowed us to investigate the effects of a range of candidate variables in the relationship between psychotic experiences and functioning. The model does not assume directionality or causality. For example, we have previously shown that psychotic experiences temporally predict suicidal behaviour (Kelleher et al., 2013a), placing them upstream of suicidality in a hierarchical model; therefore, one should not control for suicidality in a causative analysis of the relationship between psychotic experiences and functioning. Furthermore, we have shown that trauma is both upstream and downstream of psychotic experiences in a causative model (Kelleher et al., 2013c), making it difficult to assign all of its effect upstream or downstream of

psychotic experiences on a hierarchical model; therefore, one should also not control for trauma in a causative analysis. The multivariate model used in this report, however, was not part of a causative analysis of the relationship between psychotic experiences and functioning; rather, it was a model to examine whether a number of candidate variables – and variables for which the candidate variables are proxies (for example, trauma exposure may be a proxy for a number of factors, including biological factors, such as DNA methylation (Labonte et al., 2012), and psychological factors, such as negative cognitive schemas (Garety et al., 2007)) – might mechanistically account for the relationship between psychotic experiences and functioning.

Strengths and Limitations

A strength of the current study was the use of a gold-standard diagnostic clinical interview (Kaufman et al., 1996) with assessments conducted by trained mental health professionals. This strength is also a weakness since it is not possible to conduct these types of in-depth diagnostic interviews in the large numbers that are possible with questionnaires or lay interviewers. Although it was not an original hypothesis of the study that individuals with psychotic experiences would have poorer functioning than those without, interviewers rated global functioning on the CGAS as well as assessing psychotic experiences and therefore it is possible that this introduced a bias which could contribute to the statistical relationship between psychotic experiences and functioning. CGAS scores were not assessed for inter-rater reliability in this study. Our sample was composed of a narrow age range (11 to 13 year olds); research with different age groups will be valuable, as will research in clinical as well as general population samples. The multivariate analyses did not look at possible co-linearities and additional variables other than those measured in the current study may play an important role in the relationship between psychotic experiences and functioning; further research will be necessary to address this.

Conclusions

Psychotic experiences were strongly related to poor functioning, both in the population in general and amongst individuals with psychiatric disorders. In fact, individuals with psychopathology who reported psychotic experiences had a mean functioning score that was more than 10 points lower on the Children's Global Assessment Scale than individuals with psychopathology who did not report psychotic experiences. Furthermore, three quarters of the sample who reported psychotic experiences reported feeling distressed by their experiences. The relationship between psychotic experiences and functioning was partially accounted for at a mechanistic level by several variables, including multimorbid psychopathology, suicidality, neurocognitive deficits and exposure to traumatic experiences, including physical and sexual abuse and witnessing domestic violence. These variables did not fully account for the relationship, however, suggesting that there may be other important factors associated with psychotic experiences that contribute to poorer functioning. The clinical implication of these findings is to highlight the importance of assessing psychotic experiences in (non-psychotic) individuals who present to mental health services – a disclosure of psychotic experiences should alert the clinician that this individual may have significantly more functional disability than might be expected for other individuals with the same diagnosis. Further research to investigate mechanisms underlying the relationship between functioning and psychotic experiences and, most importantly, research on ways to address functional impairments in this group, will be valuable.

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Table 1: Mean Children's Global Assessment Scale score and interquartile range in study participants with and without psychotic experiences.

	All participants		Participants with a DSM IV Axis 1 disorder	
	No psychotic experiences	Psychotic experiences	No psychotic experiences	Psychotic experiences
Mean CGAS score	81.9	68.6	74.5	61.8
Interquartile range	75-91	46-85	65-85	45-75

Table 2: Univariate and multivariate relationship with global functioning, assessed using the Children's Global Assessment Scale.

	Functioning (unadjusted)	P	Functioning (adjusted)	P
Psychotic experiences	0.25 (0.14-0.44)	<0.001	0.48 (0.22-1.05)	0.066
Psychiatric disorders	0.38 (0.28-0.51)	<0.001	0.45 (0.31-0.66)	<0.001
Suicidal behaviour	0.11 (0.04-0.28)	<0.001	0.17 (0.03-1.05)	0.06
Trauma	0.10 (0.03-0.31)	<0.001	0.13 (0.03-0.65)	0.01
Trails A*	0.57 (0.44-0.75)	<0.001	0.88 (0.62-1.25)	0.47
Trails B*	0.42 (0.30-0.60)	<0.001	0.58 (0.39 to 0.87)	0.008
Symbol Coding#	2.02 (1.51-2.71)	<0.001	1.29 (0.92-1.81)	0.14
Spatial span#	1.65 (1.25-2.18)	<0.001	1.40 (1.01-1.94)	0.046

* Higher score indicates poorer performance

Lower score indicates poorer performance

In the adjusted analyses, all variables were included in one multivariate model