

The concordance of child self-reported psychotic experiences with interview- and observer-based psychotic experiences.

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Data was already collected, but I (Steffie Gundersen) have done all the statistical calculations and written the article with help from my guidance counsellor, MD PhD Pia Jeppesen.

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Introduction

Psychotic symptoms including hallucinatory experiences, delusional ideas and subjective thought disturbances in the absence of clinical disorder are often referred to as psychotic experiences (PE). PE are far more common than psychotic disorders(1), and the majority of the experiences are transitory in nature(2). Nevertheless, individuals with PE are at an increased risk for developing psychosis as well as other non-psychotic psychopathology(3-6) regardless of whether PE is measured by interview(7-9) or self-report(9). Furthermore, PE have been associated with an increased severity, comorbidity, suicidality, distress and functional impairment of the concurrent non-psychotic psychopathology (3, 10-13).

Poulton et al. provided evidence for continuity of psychotic symptoms from childhood to adulthood by following up on the children from the Dunedin general population birth cohort who reported psychotic symptoms at age 11 years(8). Since then, many have explored the field of PE in children and adolescent from the general population using both psychopathological interviews and self-reported questionnaires as the methods of assessment.

The median prevalence of PE in mostly adult general population is around 7%(14). However, a range of assessment methodologies have been used, and a much lower prevalence has been found for interview-rated PE (3.8%) compared with self-reported PE (11.9%)(14)

We carried out a systematic search of all published literature between 2000 - 2016 on the prevalence of PE in children and adolescents. A total of 25 studies(3, 8, 15-31) met our inclusion criteria, and were divided into groups based on age and method of assessment. All of the studies reported the frequencies of either self-reported PE (PE-S), interview-based measures of PE (PE-I) or both, but only one paper reported results regarding the concurrence of PE-S and PE-I. Interview-based measures of overall PE provided lower prevalences than the self-report questionnaires.

Only one study(17) compared PE-I and PE-S using the Kiddie Schedule for Affective Disorders and Schizophrenia Present and Life Time version (K-SADS-PL), and a screening questionnaire with seven items designed to screen for PE, respectively. The screening was a two-phased study in which potential PE-I was assessed in 44 11-13-year-old children. The children were divided into two groups of 22 children

considered “high-risk” and “low-risk” respectively, on the basis of high or low PE-S scores prior to the interview. Of the seven self-reported items, self-reported “verbal hallucinations” showed the highest positive and negative predictive values, (above 70%) in regard to PE-I.

The variations in the prevalence, content and severity of both PE-S and PE-I in youths are likely explained, in part, by the variation in the measurement methods. Studies reporting high prevalences of PE appear to have in common, first, the use of self-report questionnaires containing a high number of items asking about different types of PE; and, second, enquiring about PE at different levels of severity including minimal levels.

The validity of using self-report questionnaires for measuring PE in children is questionable considering the large variation in both methods of assessment and outcomes. Various questionnaires are available however many of these lack validation against clinical interview(32). Further research on larger, representative child and adolescent populations is necessary.

The current paper examines the concurrent validity of a new, highly structured questionnaire administered as part of the DAWBA, comparing it to the psychosis section of the well-validated semi-structured psychopathological and diagnostic interview KSADS-PL. The specific objective of this study is to validate the ten highly structured questions about PE for the purpose of being used both in an epidemiological and clinical context either as a part of the DAWBA or independently. To our knowledge, this is the first study to compare PE-S with an interview-based rating of PE-I in a large and representative cohort of preadolescent children. The magnitude of the Copenhagen Child Cohort 2000 (CCC2000) will allow comparisons at the level of specific phenomenological subtypes of PE-S and PE-I.

Methods

Study population and participation

The present study was part of a longitudinal birth cohort study using data from the follow-up study at age 11-12 years. The Copenhagen Child Cohort 2000 (CCC2000) comprises all 6090 children born in the year 2000 in sixteen municipalities in the County of Copenhagen, Denmark, and is representative for children born in Denmark that year regarding key perinatal and social characteristics, except for a relatively

higher representation of ethnic minorities compared to the rest of the Danish population(33). The data collection for the present study was planned prospectively. Data collection took place from May 2011 through December 2012. A total of 4847 children were eligible for follow-up. Nineteen children had died, 217 had emigrated, 14 were untraceable, and 993 had claimed ‘research protection’ (an option that allows a citizen to avoid inquiries from research and consumer surveys).

Of the 4847 eligible children, 2345 (48.3%) responded to the web-based questionnaires whereof 1864 (38.5%) completed the PE-section of the Development and Wellbeing Assessment (DAWBA). Regardless of their online self-report of PE, all 1864 participating children were invited to a face-to-face psychopathological interview and assessment of PE.

A total of 1632 (73.7%) children participated in the face-to-face examination and interview(16). Complete data from both the online PE-section of DAWBA and the face-to-face interview and assessment of PE were obtained for 1571 children, 751 (47.8%) boys and 820 (52.2%) girls. Time lag between response on the online PE-section of the DAWBA and the face-to-face examination ranged from 0-13 months. The mean variation was 0.49 months (SD 1.45), and 93.5% of the children attended the face-to-face examination within 0-3 months after completing the online questionnaire. Ten children attended the face-to-face psychopathological interview and assessment of PE before completing the web-based questionnaires, including the PE-section of DAWBA. There was no significant difference in time variation between children with PE-S and those without.

Instruments measuring psychotic experiences and impact at 11-12 year

Self-reported PE: The DAWBA is a comprehensive online questionnaire administered to parents, children (from age 11 years), and teachers(34). It is a diagnostic instrument with a new section on PE, which is yet to be validated. The DAWBA section on PE addressed only the children since parents (and teachers) are seldom aware of these subtle changes in children’s perceptions, ideations and subjective thought disturbances. The child was asked about ten different “strange experiences that are surprisingly common”. Each type of PE was explained by an example, “Bill hears voices in his head. For example, he hears strange voices that speak to him or about him”, and followed by a question: “Do you ever hear voices in your head?” The experiences were scored “no”, “sometimes” or “often”. The 10 items covered auditory

and visual hallucinations, and various delusional ideas and subjective thought disturbances.

In the present study, scores of “sometimes” and “often” were collapsed into a positive rating of any PE to match the score of ‘likely/definitely present’ in K-SADS-PL. The strange experiences (PE-S) were scored with regard to temporal relationship to sleep, alcohol/drugs, fever, epilepsy, brain damage, depressed or elevated mood, age of onset, insight (“Do you think your strange experiences are due to your mind playing tricks on you?”), external perspective, distress and interference with social functions. The attribution questions were not linked directly to each PE question but asked about attribution to overall PE. Attribution to sleep, alcohol/drugs, fever, neurological disorder, depressed or elevated mood was scored by the child, ranging from “no” to “always”. For a secondary analysis, only PE without attribution to sleep, alcohol/drugs, fever or neurological disorder were included. Children with PE attributed to depressed or elevated mood were not excluded.

The DAWBA PE-section concluded with open-ended questions probing the children to describe the “strange experiences” in their own words, however The reporting of attribution, insight, distress and explanatory free text answers in the DAWBA added value to the individual diagnostic assessment of the children, which, however, was not the purpose of this study. Here we explored only the highly structured DAWBA questions on PE, thus making the instrument comparable to other highly structured self-report questionnaires.

Interview-based PE: We used the K-SADS-PL sections on psychosis(35) to conduct a semi-structured interview with clinical probing and cross-examination of PE, using 22 items covering 9 types of hallucinations and 13 types of delusions. The cut-off for PE-I was defined a priori. Symptoms were scored dichotomously as ‘not present’ (corresponding to a score of 0 or 1) vs. ‘likely/definitely present’ (corresponding to a score of 2 or 3) during the last month and/or lifetime before. PE-I was rated ‘not present’ if occurring only in relation to sleep, substance use, fever or somatic illness. The interview was conducted independently of whether or not the child had been screened positive for PE using the DAWBA, as the interviewers were blinded for all results of the web-based questionnaires. Two medical doctors, two psychologists and two students who were trained in the K-SADS performed the interviews, and

participated in bi-monthly supervision sessions conducted by the last author who is a consultant child and adolescent psychiatrist.

Statistical Analysis

All statistical analyses were carried out in SPSS (Statistical Package for Social Science).

Results

Study population

The attrition analyses comparing the 1571 participating children with the 4500 nonparticipating children demonstrated overall sufficient representativeness. However, there was a small overrepresentation of children with highly educated, ethnic Danish parents (table 1). Secondary attrition analyses was performed for the 1864 children with a full DAWBA-PE section, showing minor differences between participants and non-participants of the same type and range as described for the selection of the 1571 children (data not presented).

Frequency of psychotic experiences and their predictive values

A total of 28.1% (n=441) of the 1571 children responded 'sometimes' or 'often' to at least one screening question. The prevalence of PE-S in the sample of 1864 children was virtually the same (28.3%). PE-I rendered a prevalence of 10.2% (n=160). Internal auditory hallucinations were the most common self-reported phenomenon reported by 10.7% (n=168) of the children. The question about internal auditory hallucinations in the DAWBA covers hearing weird voices inside your head, who are either talking directly to you or about you. Visual hallucinations were reported by 9.8% (n=154) of the children. The least frequently endorsed self-reported item was "delusional misinterpretation" with a prevalence of only 1.8% (n=29). Table 2 shows the prevalences as well as the predictive values of any PE-S and each of the ten specific PE-S based on DAWBA items for any PE-I. The predictive values of any PE-S for any PE-I showed a sensitivity of 73.8%, specificity of 77.1%, PPV of 26.8%, NPV of 96.3%, +LR of 3.2 and a -LR of 0.3. A post-hoc sensitivity analysis showed similar predictive values of PE-S for the prediction of PE-I when considering only children who had only experienced PE-I within the last month (n=106).

Visual hallucinations exhibited the overall highest predictive values with a sensitivity of 43.1%, specificity of 94.0%, PPV of 44.8% and an NPV of 93.6%.

Table 3 displays the predictive power of each of the ten items of the screening questionnaire for the corresponding type of psychotic experience in K-SADS-PL. The two single items with the highest predictive power were “Delusions of persecution”, providing a PPV of 29.3% and an NPV of 97.8% for interview based delusions of persecution and “Visual hallucinations” providing a PPV of 29.3% and a NPV of 97.6% for interview verifiable visual hallucinations.

In terms of attribution, table 4 presents the prevalence and predictive values for overall PE-S (with no consideration of attribution) as well as for PE-S not occurring in the context of sleep, alcohol/drugs, fever or neurological disorder. Counting only the latter type of PE-S lowered the prevalence to 24.3% but did not improve the predictive values.

Discussion

Like pain, PE are subjective phenomena, which can only truly be reported by the person experiencing them. Perhaps self-report questionnaires assess the core of the subjective perception and therefore may represent an adequate method to capture the true prevalence of PE in children and adolescents?

The present study represents the first to compare the new section on psychotic experiences from DAWBA with a semi-structured interview (K-SADS-PL) and also presents the largest population-based sample of children ever examined with both a self-report questionnaire and interview-based measures of PE.

We found that 28.1 % of the children reported having at least one lifetime PE-S, while 10.2 % were rated as having at least one lifetime PE-I. As for specific item comparison to any PE-I, the first DAWBA item “Visual hallucinations” was best at predicting any interviewer-rated psychotic experience. Item-specific comparison showed that DAWBA items 1 “Visual hallucinations” and 8 “Delusions of persecution” provided the greatest predictive powers.

“Because individual types of PE-S cannot predict “any” PE-I, as expected, poor -LRs were found for all specific PE-S individually with respect to any PE-I. The negative LR were also small for specific PE-S with respect to specific PE-I, however somewhat larger, indicating that type of PE-S was somewhat specific with regard to type of PE-I. We explored if excluding PE, frequently attributed to sleep, substance

use, fever or neurological disorder would improve the prediction. Taking attribution into consideration decreased the prevalence of PE-S but also worsened the predictive values.

Others also found that experiences of “auditory hallucinations”, “visual hallucinations” and “paranoid ideation” were the most common PE(15, 17, 19, 28). The common manifestation of hallucinations is in accordance with the psychopathology presented by children and adolescents in at-risk samples(36) and with clinical psychosis(37).

The main strength of the present study is the large population based sample, which allowed us to estimate the prevalence of both PE-S and PE-I, and to examine the predictive values of the DAWBA-based PE-S for the K-SADS-based PE-I.

Furthermore, both the PE-S positive and PE-S negative children were assessed by interview which is unique in population samples of children and adolescents.

The delay between the DAWBA and the K-SADS interview varied from days to months. For optimal conditions, the time passing between the children filling out the self-report questionnaire and attending the interview should be brief and of the same length for all participants, and the varied delay might introduce random error, lowering the predictive values of the PE-S for PE-I. The positive selection of participants with highly educated, ethnic Danish parents might introduce a selection resulting in lower prevalence of PE. However, the weighted prevalence of PE-I (10.9%) was very similar to the crude prevalence of PE-I (10.5%) in the sample when adjusting for perinatal and sociodemographic factors (10). An additional limitation is that no data on adverse events are presented. Furthermore, we have not investigated the test-retest reliability.

The large variation in number of items and content of the different existing questionnaires raises the question of what a good PE-questionnaire for self-report should contain. The PE-section of the DAWBA is a brief, easily comprehensible self-report questionnaire containing no more than ten questions of PE. Each of the ten questions is presented to the child as a brief vignette describing an example of the specific type of experience in a child with the same gender (indicated by a name). This way of presenting the child to the ten “strange experiences that are surprisingly common” makes the questions easy to relate to and understandable for this age group. Even the title of the questionnaire in itself converts something strange and possibly

scary into something common. Comparing DAWBA to the assessment methods in the studies included in the systematic search, the number and type of phenomena assessed throughout the questionnaire seems suitable. The questions cover the most common phenomena as hallucinations and paranoia while also incorporating the rare but diagnostically important phenomena. This is done without including redundant questions representing similar symptoms.

In sum, psychotic experiences are common in children, particularly when self-reported. Our findings suggest that the self-report questionnaire developed for the DAWBA can be used to screen for psychotic experiences in the general population of children. The high specificity and NPV indicate that children without PE are sufficiently filtered out, leaving secondary examinations to be carried out in the PE-positive children.

The field of screening children and adolescents for PE is in need of more consistency, and future studies should explore the clinical correlates of self-reported PE in this age group.

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TABLE 1. Attrition analysis comparing participants and non-participants on key perinatal and socioeconomic variables.

Variable	Entire cohort alive (N = 6071) n (%)	Participants (N =1571) n (%)	Non-participants (N =4500) n (%)
Sex, boys	3115 (51.3)	751 (47.8)	2364 (52.5)
Gestational age			
<31	42 (0.7)	3 (0.2)	39 (0.9)
32-36	277 (4.6)	61 (3.9)	216 (4.9)
>36	5689 (94.7)	1494 (95.9)	4195 (94.3)
Birth weight (g)			
<1500	42 (0.7)	3 (0.2)	39 (0.9)
1500-2499	236 (4.0)	63 (4.1)	173 (3.9)
2500-4499	5453 (91.6)	1401 (91.4)	4052 (91.7)
>4500	221 (3.7)	66 (4.3)	155 (3.5)
Parity			
1	2139 (38.1)	568 (39.0)	1571 (37.7)
2	2387 (42.5)	649 (44.5)	1738 (41.8)
3	785 (14.0)	191 (13.1)	594 (14.3)
4	309 (5.5)	50 (3.4)	359 (6.2)
Parents born outside Denmark			
0 parents	4277 (72.3)	1255 (80.8)	3022 (69.3)
1 parent	692 (11.7)	158 (10.2)	534 (12.2)
2 parents	944 (16.0)	140 (9.0)	804 (18.4)
Completed education by mother in 2010 (years)			
1-10			
11-14	1114 (19.4)	161 (10.4)	953 (22.7)
>14	2845 (49.5)	760 (49.0)	2085 (49.6)
	1792 (31.2)	629 (40.6)	1163 (27.7)
Family constitution at birth			
Both parents			
One parent	5040 (83.3)	1400 (89.3)	3640 (81.2)
Reconstituted family	670 (11.1)	107 (6.8)	563 (12.6)
Child outside family	327 (5.4)	61 (3.9)	266 (5.9)
	14 (0.2)	0	14 (0.3)
Any change in family composition by 2010	1767 (30.3)	354 (22.6)	1413 (33.2)
Parents living together at the birth of their child	5557 (91.8)	1497 (95.5)	4060 (90.5)

TABLE 2. Agreement between each of the ten self-reported Development and Well Being Assessment (DAWBA) psychotic experiences items and any interview-based rating of psychotic experiences using the Schedule for Affective Disorders and Schizophrenia for School Aged Children-Present and Lifetime Version (K-SADS-PL).

Item	DAWBA Prevalence n (%)	TP n (%)	FP n (%)	FN n (%)	TN n (%)	Sensitivity	Specificity	PPV	NPV	LR+/-
Any psychotic experience	441 (28.1)	118 (7.5)	323 (20.5)	42 (2.7)	1088 (69.3)	73.8	77.1	26.8	96.3	3.2/0.3
Visual hallucinations	154 (9.8)	69 (4.4)	85 (5.4)	91 (5.8)	1326 (84.4)	43.1	94.0	44.8	93.6	7.2/0.6
Auditive hallucinations (inside head)	168 (10.7)	68 (4.3)	100 (6.4)	92 (5.9)	1311 (83.5)	42.5	92.9	40.5	93.4	6.0/0.6
Auditive hallucinations (outside head)	143 (9.1)	46 (2.9)	97 (6.2)	114 (7.3)	1314 (83.6)	28.7	93.1	32.2	92.0	4.2/0.8
Thought insertion	114 (7.3)	39 (2.5)	75 (4.8)	121 (7.7)	1336 (85)	24.4	94.7	34.2	91.7	4.6/0.8
Thought withdrawal	89 (5.7)	24 (1.5)	65 (4.1)	136 (8.7)	1346 (85.7)	15.0	95.4	27.0	90.8	3.3/0.9
Replacement of will by external force	40 (2.5)	24 (1.5)	16 (1)	136 (8.7)	1395 (88.8)	15.0	98.9	60.0	91.1	13.6/0.9
Delusional misinterpretation	29 (1.8)	16 (1)	13 (0.8)	144 (9.2)	1398 (89)	10.0	99.1	55.2	90.7	11.1/0.9
Delusions of persecution	75 (4.8)	40 (2.5)	35 (2.2)	120 (7.6)	1376 (87.6)	25.0	97.5	53.3	92.0	10/0.8
Grandiosity	92 (5.9)	33 (2.1)	59 (3.8)	127 (8.1)	1352 (86.1)	20.6	95.8	35.9	91.4	4.9/0.8
Delusional mood and perplexity†	92 (5.9)	46 (2.9)	46 (2.9)	114 (7.3)	1365 (86.9)	28.7	96.7	50.0	92.3	8.7/0.7

Sample size (n) = 1571, Any psychotic experience in K-SADS-PL (n) = 160 (10.2%). Abbreviations: TP = true positives, FP = false positives, FN = false negatives, TN = true negatives, PPV = positive predictive values, NPV = negative predictive values.

†There is no matching item for “Delusional mood and perplexity” in the K-SADS-PL

TABLE 3. Agreement between each of the ten self-reported Development and Well Being Assessment (DAWBA) psychotic experiences items and the corresponding interview-based item of the Schedule for Affective Disorders and Schizophrenia for School Aged Children-Present and Lifetime Version (K-SADS-PL).

Item	DAWBA Prevalence n (%)	K-SADS-PL Prevalence n (%)	TP n (%)	FP n (%)	FN n (%)	TN n (%)	Sensitivity	Specificity	PPV	NPV	LR+/-
Visual hallucinations	154 (9.8)	79 (5.0)	45 (2.9)	109 (6.9)	34 (2.2)	1383 (88)	57	92.7	29.2	97.6	7.8/0.5
Auditive hallucinations (inside head)	168(10.7)	38 (2.4)	22 (1.4)	146 (9.3)	16 (1)	1387 (88.3)	57.9	90.5	13.1	98.9	6.1/0.5
Auditive hallucinations (outside head + combination)	143 (9.1)	55 (3.5)	21 (1.3)	122 (7.8)	34 (2.2)	1394 (88.7)	38.2	92	14.7	97.6	4.8/0.7
Thought insertion	114 (7.3)	8 (0.5)	5 (0.3)	109 (6.9)	3 (0.2)	1454 (92.6)	62.5	93	4.4	99.8	8.9/0.4
Thought withdrawal	89 (5.7)	4 (0.3)	1 (0.1)	88 (5.6)	3 (0.2)	1479 (94.1)	25	94.4	1.1	99.8	4.5/0.8
Replacement of will by external force	40 (2.5)	9 (0.6)	2 (0.1)	38 (2.4)	7 (0.4)	1524 (97)	22.2	97.6	5	99.5	9.3/0.8
Delusional misinterpretation	29 (1.8)	0 (0)	0	29 (1.8)	0	1542 (98.5)	0	98.2	0	1	-
Delusions of persecution	75 (4.8)	55 (3.5)	22 (1.4)	53 (3.4)	33 (2.1)	1463 (93.1)	40	96.5	29.3	97.8	11.4/0.6
Grandiosity	92 (5.9)	16 (1)	9 (0.6)	83 (5.3)	7 (0.4)	1472 (93.7)	56.3	94.7	9.8	99.5	10.6/0.5
Delusional mood and perplexity†	5.9	-	-	-	-	-	-	-	-	-	-

Sample size (n) = 1571, Abbreviations: TP = true positives, FP = false positives, FN = false negatives, TN = true negatives, PPV = positive predictive values, NPV = negative predictive values.

†There is no matching item for “Delusional mood and perplexity” in the K-SADS-PL

TABLE 4. The prevalence of predictive values for a) PE-S without considering attribution and b) PE-S counting only cases with no frequent attribution, using the interview-and observer-based rating of psychotic experiences (PE-I) as criterion for a true case.

	DAWBA/K-SADS-PL any PE	DAWBA with no frequent attribution/K-SADS-PL any PE
PE-S prevalence (%)	28.1	24.3
Sensitivity (%)	73.8	55.6
Specificity (%)	77.1	79.3
PPV (%)	26.8	23.4
NPV (%)	96.3	94.0

Sample size (n) = 1571. Abbreviations: PE-S = self-reported PE from The DAWBA questionnaire, K-SADS-PL=Schedule for Affective Disorders and Schizophrenia for School Aged Children-Present and Lifetime Version.