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Are psychotic experiences among detained juvenile offenders explained by trauma and substance use?

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ABSTRACT

Objective: High rates of psychotic experiences among detained adolescents have been reported. However, the significance of psychotic experiences in detained juveniles is still poorly understood. The current study, therefore, (1) examines whether psychotic experiences could be explained by substance use and/or traumatic experiences, and (2) investigates this objective without taking into account the frequently occurring paranoia-related symptoms that may not be psychosis-related in detained minors.
Method: Data were derived from 231 detained adolescents. By means of the Diagnostic Interview Schedule for Children, psychotic experiences, life-threatening events and substance use were assessed while the Child Traumatic Questionnaire was used for a history of abuse and neglect.
Results: In univariate logistic regression analyses, having psychotic experiences was positively associated with substance-related (e.g. past year intense marihuana use) and trauma-related (e.g. emotional abuse) variables. However, without taken paranoia-related experiences into account, different associations between psychotic experiences and substance-related and/or trauma-related variables were found. After building best fitting models, logistic regression analyses demonstrated a preponderance of trauma-related over substance-related variables in predicting the number of psychotic experiences (i.e. 0, 1–2, >2).
Conclusion: These findings suggest that psychotic experiences in detained adolescents may be explained by trauma and substance use. In addition, paranoia-related experiences seemed to be particularly associated with emotional abuse.

1. Introduction

In contrast to the numerous reports on psychotic disorders in adult offenders, sound investigations of psychotic disorders in juvenile delinquents are rare. The few existing studies on psychotic disorders in adolescent detainees have provided prevalence rates ranging from 1% to 4% (Colins et al., in press; Gosden et al., 2003; Hollander and Turner, 1985; McManus et al., 1984; Richards, 1996; Teplin et al., 2002). When including psychotic experiences as described by van Os et al. (Johns and van Os, 2001; van Os et al., 2000), more studies in detained youths can be found, with rates from 25% up to 75% (Atkins et al., 1999; Teplin et al., 2002; Ulzen and Hamilton, 1998; Vreugdenhil et al., 2004). Most clinicians working with juvenile offenders will not agree that these enumerated psychotic experiences indicate a clinical psychotic disorder. At present, it is still unclear whether such experiences are really psychotic, or phenomena that occur in the range of other disorders (Vermeiren et al., 2006) In addition, a substantial proportion of the general population have psychotic experiences without having any psychiatric diagnosis, or without being in need for care (Escher et al., 2002; Hanssen et al., 2005; Nishida et al., 2008), suggesting that such experiences do not need to be markers of poor mental health.

As research in community and clinical samples shows a relation between childhood abuse and psychotic experiences (Janssen et al., 2004; Read et al., 2005), the high levels of childhood abuse in detained adolescents (Haapasalo and Hamalainen, 1996; Ulzen and Hamilton, 1998; Yoshinaga et al., 2004) may well account for the enumerated psychotic experiences. However, while most research has focused on the impact of physical and sexual abuse (Bernstein et al., 2003), there is an increasing body of evidence that different types of traumatic experiences have different psychopathological outcomes. Therefore, when studying the relation

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between psychotic symptomatology and trauma, screening for a history of emotional abuse and neglect, physical neglect and other life-threatening events is warranted (Chapman et al., 2004; Cohen et al., 1996; Spauwen et al., 2006; Wenar and Kerig, 2006). The high numbers of psychotic experiences in detained youth could also be explained by their high rates of illegal substance use (marihuana, amphetamines and cocaine) (Vreugdenhil et al., 2003), especially because these three substances are likely to be associated with the expression of psychotic experiences (Thirthalli and Benegal, 2006). The most systematic evidence is, however, available for marihuana, which has frequently been reported to exacerbate psychotic experiences (Arseneault et al., 2002; Henquet et al., 2005; Thirthalli and Benegal, 2006). Finally, because childhood traumatic experiences are also associated with substance use (Crimmins et al., 2000; De Bellis, 2002), psychotic experiences in detained youth may be related simultaneously to substance use and trauma. Therefore, it is important to examine whether substance use only, trauma only or both are significantly associated with psychotic symptomatology when both substance- and trauma-related variables were examined. If, for example, significant associations between substance use disappear after controlling for trauma, while these trauma-related variables remain significant, this may suggest that substance use plays an important role in the association between trauma and psychotic experiences. However, most studies that examined the relation between substance use and psychotic experiences and adjusted for trauma, did not present the strength of the association between trauma and psychotic disorder (e.g. Fergusson et al., 2005; Henquet et al., 2005). Likewise, studies that examined the relation between trauma and psychotic experiences and adjusted for substance use, did not present the strength of the relation between substance use and psychotic disorder (e.g. Janssen et al., 2004).

To the best of our knowledge, this is the first study that specifically was designed in order to better understand the relation between psychotic experiences in detained juveniles on the one hand and substance use and trauma on the other. Based on existing literature, the following research questions were addressed. First, would a large proportion of detained boys report at least one psychotic experience? Second, what proportion of participants with at least on psychotic experience met criteria for comorbid psychiatric disorders? (We anticipated that only a small percentage of participants with psychotic experiences would be diagnosed with a psychotic disorder according Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), in contrast to other psychiatric disorders. Third, would trauma-related variables be positively associated with psychotic experiences and substance related variables? Fourth, when traumatic experiences and illegal substance use are considered simultaneously, would both jointly be positively associated with psychotic experiences, controlling for potential confounders (age, origin, socioeconomic status) known from the literature (Janssen et al., 2003; Janssen et al., 2004; Veling et al., 2007). Last, because juvenile detainees are expected to show high levels of paranoia-related experiences that may be related to their history and current legal status, for example because they are secretly being watched during detention (e.g. spy hole), would the same relationships be found when excluding paranoia-related features from the psychotic experience variable?

2. Materials and method

2.1. Subjects

Between January 2005 and February 2007, 305 recently detained male minors (aged 12–18) from the three Youth Detention Centers (YDC) for boys in Flanders were randomly selected for inclusion after having entered the YDC. Reason for selecting was the large number of youths entering the detention center weekly, which did not allow to include all eligible candidates. Criteria for inclusion were: being of Belgian or Moroccan origin, having been placed for at least one month, and having sufficient knowledge of Dutch. The origin-related inclusion criterion was put forward because nationalities in the YDC are too diverse to examine all subgroups in large enough numbers. Therefore, we decided to focus on the largest 'non-Belgian' subgroup in the YDC, namely youths of Moroccan origin. Of those 305 boys, 15 could not be approached, while 45 boys refused participation resulting in a participation rate of 80% ($N = 245$). Of those, 14 participants were excluded from the current study because only the psychosis screen of the Schizophrenia module was used. The total sample of the current study therefore is 231.

2.2. Procedure

This study was approved by the institutional review board of the Faculty of Psychology and Educational Sciences, Ghent University. The study was conducted following a standardized research procedure. All selected detainees were approached individually by the researcher and given oral and written information about the aims, the content and the duration of the interviews. They were assured that their information was confidential and that refusal to participate would not affect their judicial status or stay in the YDC. The boys then could consult their primary caregivers or other adults about participation. Participants had to give written informed consent before starting the study. Participants were interviewed in a private area in the YDC by the Diagnostic Interview Schedule for Children (DISC) – trained first author and two DISC – trained final – year university special education students who did not belong to the YDC personnel. The interview took place between the 4th and 21th day after detention intake. No compensation was given. A standard procedure for presenting the assessment instruments was followed.

2.3. Measures

2.3.1. Psychotic experiences

To assess the past year prevalence of psychotic experiences, the Schizophrenia section of the DISC-IV was administered (Shaffer et al., 2000). The DISC-IV is a structured psychiatric interview designed for interviewing children aged nine to 17 years that allows one to make diagnoses in childhood and adolescence according to DSM-IV criteria. The test-retest reliability of the DISC-IV in clinical and community samples was described as adequate (Shaffer et al., 2000). The Schizophrenia module inquires the past year presence (yes or no) of 22 psychotic experiences: 14 delusional (of which five paranoia-related), six hallucinatory and two catatonic experiences (Table 1). Psychotic experiences were not normally distributed, while transformation procedures such as log transformation did not normalize the distribution of these experiences. In line with previous research the relation between psychotic experiences and variables of interest were examined by considering group status based on the number of psychotic experiences. A total count was used to create a dependent variable *Psychotic experience group*. Based on previous general population studies differentiating participants with zero, one, two and three or more psychotic experiences (PE) (Mojtabai, 2006; Ross et al., 1994), and the number of participants in this study, a three group classification was chosen: zero (0 PE) vs. one or two (1–2 PE) vs. more then two (> 2 PE) psychotic experiences. Participants with one or two psychotic experiences were combined because unstable estimates due to small sample size were expected.

2.3.2. Psychiatric disorders

The DISC-IV was used to assess past year prevalence of any disruptive behavior disorder (DBD) (i.e. Attention Deficit/Hyperactivity Disorder, Oppositional Defiant Disorder and Conduct Disorder), any substance use disorder (SUD) (i.e. Alcohol, Marihuana and Other substance use disorder), any mood disorder (i.e. Major Depression and Dysthymia) and any anxiety disorder (Posttraumatic Stress Disorder and Separation Anxiety Disorder). In order to identify detained boys that are probably indicative of a psychotic disorder, an experienced child psychiatrist (K.A.) reviewed the DISC-IV Schizophrenia Module of those participants that reported at least one psychotic experience.

2.3.3. Trauma-related variables

A history of child abuse or neglect was based on the Childhood Trauma Questionnaire – Short Form (CTQ) (Bernstein et al., 2003). The CTQ consists of a five-point Likert type scale that reflects the frequency of abuse or neglect: '0', never true; '1', rarely true; '2', sometimes true; '3', often true; '4', very often true. Five types of abuse or neglect are assessed by four items each (see Supplementary Data). For each abuse or neglect scale a total score variable was created by summing up the Likert-scores of the four scale items A continuous *Multimaltreatment* variable was created after the abuse and neglect subscales were recoded into five dichotomies (maltreatment vs. no maltreatment). This dichotomization was based on a cut-off score that corresponds with being below (no maltreatment) or on/above (maltreatment) the 4th quartile. In doing so, and given the low prevalence of high subscale scores for physical and sexual abuse, participants who were seldom or sometimes abused physically or sexually were also considered to be maltreated. Adding up these five dichotomized variables resulted in the continuous variable multimaltreatment (score from 0–5).

Table 1
Past year prevalence of psychotic experiences ($N = 231$).

	N (%)
Any psychotic experience	181 (78.4)
Any delusional experience	167 (72.3)
Any paranoid (i.e. paranoia-related) delusional experience	155 (67.1)
Thought that people who were talking with each other were talking about or laughing about them[a]	102 (44.2)
Thought that people were following them[a]	66 (28.6)
Thought that others were spying on them[a]	57 (24.7)
Thought that someone was complotting against them, or trying to hurt or poison them[a]	32 (13.9)
Believed that they were secretly being tested or experimented on[a]	30 (13.0)
Pure paranoid delusional experience	63 (27.3)
Paranoia and other delusional experience	91 (39.4)
Any other (i.e. non-paranoid) delusional experience	59 (25.5)
Believed they could hear thoughts of other people	17 (7.4)
Believed a book, a paper or a song was intended only for them	16 (6.9)
Were convinced that they were under control of some power or force, so actions and thoughts were not their own	13 (5.6)
Convinced that strange thoughts, or thoughts that were not their own, were being put directly into their mind	13 (5.6)
Believed others could read their thoughts	13 (5.6)
Thought that there were being sent special messages through television or radio, or that a program had been arranged just for them alone	9 (3.9)
Believed others could hear their thoughts	9 (3.9)
Felt strange forces working on them, like they were hypnotized or bewitched or being struck by X-rays or laser beams	5 (2.2)
Convinced someone or something could steal their thoughts out of their heads	5 (2.2)
Any hallucinatory experience	99 (42.9)
Heard things other people could not hear, like a voice	41 (17.7)
Had the experience of seeing something or someone that others present could not see- that is had a vision while they were awake	41 (17.7)
Heard a voice other people could not hear	33 (14.3)
Had unusual feelings in or on their bodies, like being touched when nothing was there or feeling something moving inside their bodies	33 (14.3)
Had a strange taste in their mouths that could not be explained by something they ate or put into their mouths	32 (13.9)
Bothered by strange smells around them that nobody else was able to smell, perhaps even odors coming from their own bodies	8 (3.5)
Any catatonic behavior	36 (15.6)
Could not stop moving	26 (11.3)
Could not move at all	16 (6.9)
Any psychotic experience (without paranoia-related experiences)	118 (51.1)

[a] Paranoia-related experience.

Life-threatening events were assessed with the Posttraumatic Stress Disorder (PTSD) module of the DISC-IV, including the following items: ever been in a bad accident, like a car crash/ever been upset by seeing a dead body/pictures of a dead body of someone they knew well/ever seen, other than on television/movies someone get hurt very badly or be killed/ever been in a fire, flood, earthquake, or other natural disaster where they thought they were going to die or be seriously injured. The remaining trauma-related questions of the DISC PTSD module were excluded from the current study because of considerable overlap with the CTQ. Finally, a continuous variable *life-threatening events* was made operational by adding up the four above-mentioned items (score from 0–4).

2.3.4. Substance use-related variables

The DISC-IV Substance Use module was administered to assess lifetime substance use and the intensity of use in the past year. Three dichotomous variables with regard to lifetime use were created: *Lifetime marihuana use, lifetime amphetamine use* and *lifetime cocaine use*. In addition, *past year intense marihuana use, past year intense amphetamine use* and *past year intense cocaine use* assessed whether or not there was a period in the past year when participants used these substances on a weekly basis (i.e. between one to two days a week and almost every day).

2.3.5. Sociodemographic characteristics

Standardized information about age, origin and parental occupation was assessed by means of a self-report questionnaire designed by the authors. Low socioeconomic status (SES) was made operational by placing parents in the low-level category if both were unemployed or holding a low-level job (unskilled or skilled labor).

2.3.6. Crime-related data

Crime-related information on the reason for past year detention was derived from the registration systems used in the YDCs and was hierarchically ordered in four index offending categories (violent, property, substance-related and status offending), while official criminal data from the Public Prosecutor was used to record the number for life-time total crimes, violent crimes and non-violent crimes.

2.4. Statistics

First, prevalence rates of psychotic experiences were calculated (cf. research question one) Second, the prevalence of psychiatric disorders within participants with any psychotic experience was assessed (cf. research question two). Third, distributions of substance use-related and trauma-related variables were presented by psychotic experience group status (0 PE, 1–2 PE, >2 PE), and a series of univariate logistic regression analyses were conducted to examine associations between each independent variable and psychotic experience group status (cf. research question three). Fourth, a best fitting logistic regression model was developed for predicting PE group membership (Homer and Lemeshow, 2000). In the first step, age, SES and origin were entered simultaneously as adjusting variables. In the second step, all trauma-related and substance use-related variables with $p < .25$ in the univariate logistic regression analyses were entered and the best fit model was derived by using forward conditional selection. Multicollinearity was checked for, while linearity requirements for continuous variables were met. Outliers were excluded from the multivariate analyses by means of casewise listing of residuals (cf research question four). Fifth, previous statistical analyses were repeated after exclusion of the paranoia-related symptoms (Table 1) (cf research question five). All tests were two-tailed with .05 as an indication for statistical significance. Data analyses were performed using SPSS 12.0.

3. Results

3.1. Prevalence of psychotic experiences

When individual symptoms were considered, the prevalence varied from 2% ('felt strange forces working on them') to 44% ('people were talking and laughing about them') (Table 1). Overall, 78% of participants experienced at least one psychotic experience, 72% reported some delusional and 43% some hallucinatory experience. Although paranoia-related symptoms occurred frequently (67%), when excluding them from the total psychotic experience count, the overall prevalence for any psychotic experience (51%) as well as for any delusional experience (25%) remained high.

3.2. Prevalence of psychiatric disorders within participants with any psychotic experience

Of participants ($N = 181$) with at least one psychotic experience, 88% had another psychiatric disorder; 71% met criteria for a DBD, 78% for a SUD, 18% for mood disorder, 11% for anxiety disorder. After reviewing the psychosis interview section, 9% had symptoms that

Table 2
Distribution of sociodemographics, substance-related and trauma-related characteristics by psychotic experience group status (with and without paranoia).

	Total % or mean	With paranoia			Without paranoia		
		0 PE % or mean	1–2 PE % or mean	>2 PE % or mean	0 PE % or mean	1–2 PE % or mean	>2 PE % or mean
Sociodemographics							
Age (mean)	15.99	15.92	15.89	16.10	15.99	15.97	16.0
Low SES (vs. high)	65.8	73.5	63.5	63.5	64.5	69.2	63.8
Moroccan origin (vs. Belgian)	21.6	26.0	26.3	15.8	29.9	13.0	16.3
Substance-related variables							
Lifetime marihuana use	83.1	76.0	78.8	90.1	77.0	88.4	89.8
Lifetime amphetamine use	52.4	46.0	43.8	62.4	44.2	55.1	67.3
Lifetime cocaine use	35.5	30.0	27.5	44.6	26.5	43.5	44.9
Past year intense marihuana use	65.4	56.0	57.5	76.2	59.3	68.1	75.5
Past year intense amphetamine use	25.5	22.0	18.8	32.7	17.7	31.9	34.7
Past year intense cocaine use	13.0	12.0	10.0	15.8	8.8	17.4	16.3
Trauma-related variables (mean)							
Emotional abuse	2.67	1.76	1.94	3.68	2.42	2.80	3.04
Physical abuse	1.24	0.72	0.97	1.70	1.15	1.49	0.92
Sexual abuse	0.41	0.26	0.46	0.45	0.36	0.46	0.45
Emotional neglect	5.33	4.26	5.56	5.74	5.17	5.49	5.45
Physical neglect	1.33	0.86	1.06	1.77	1.12	1.20	2.00
Multimaltreatment	0.42	0.24	0.31	0.58	0.35	0.42	0.47
Life-threatening events	1.25	1.06	1.11	1.45	1.11	1.23	1.57

were "probably indicative of a psychotic disorder", of whom all had at least one other psychiatric disorder.

3.3. Trauma-related and substance-related variables by psychotic experience groups

Table 2 shows sociodemographics, substance-related and trauma-related characteristics for the total sample and by psychotic experience (PE) group (with and without paranoia). PE groups (with and without paranoia) did not significantly differ with regard to crime severity (i.e. reason for past year detention and number of total, violent and non-violent life-time criminal history) (available upon request).

3.4. Univariate associations of trauma-related and substance-related variables with PE group status

3.4.1. Including paranoia-related experiences. Table 3 shows that (i) 1–2 PE (vs. 0 PE) was not significantly associated with any substance-related or trauma-related variable; (ii) >2 PE (vs. 0 PE) group status was significantly positively associated with lifetime marihuana use, past year intense marihuana use, emotional abuse and neglect, physical neglect, multimaltreatment and life-threatening events; and (iii) >2 PE (vs. 1–2 PE) was significantly positively associated with lifetime marihuana, amphetamine and cocaine use, past year intense marihuana use, emotional abuse, multimaltreatment and life-threatening events.

3.4.2. Excluding paranoia-related experiences. Table 4 shows that (i) 1–2 PE (vs. 0 PE) group status was significantly positively associated with lifetime cocaine use and past year intense amphetamine use, but not with any trauma-related variables; (ii) >2 PE group status (vs. 0 PE) was significantly positively associated with lifetime amphetamine and cocaine use, past year intense amphetamine use, physical neglect, and life-threatening events; and (iii) >2 PE group status (vs. 1–2 PE) was not significantly associated with any variable of interest.

Table 3
Univariate associations between trauma-related and substance-related variables and psychotic experience group status with paranoia[a].

	1–2 PE (vs. 0 PE) OR (CI)	>2 PE (vs. 0 PE) OR (CI)	>2 PE (vs. 1–2 PE) OR (CI)
Substance-related variables			
Lifetime marihuana use	1.17 (0.50–2.72)	2.87 (1.44–7.22)*	2.46 (1.06–5.71)*
Lifetime amphetamine use	0.91 (0.45–1.86)	1.95 (0.98–3.87)†	2.13 (1.17–3.87)*
Lifetime cocaine use	0.89 (0.41–1.93)	1.88 (0.91–3.86)†	2.12 (1.13–3.97)*
Past year intense marihuana use	1.06 (0.52–2.17)	2.52 (1.22–5.19)*	2.37 (1.25–4.49)**
Past year intense amphetamines use	0.82 (0.34–1.96)	1.72 (0.78–3.78)†	2.10 (1.04–4.23)*
Past year intense cocaine use	0.82 (0.27–2.51)	1.38 (0.51–3.78)	1.69 (0.68–4.19)
Trauma-related variables			
Emotional abuse	1.03 (0.89–1.19)	1.19 (1.05–1.34)**	1.16 (1.06–1.28)**
Physical abuse	1.05 (0.89–1.24)	1.15 (0.99–1.33)†	1.09 (0.98–1.21)†
Sexual abuse	1.16 (0.83–1.61)	1.17 (0.84–1.64)	1.00 (0.79–1.26)
Emotional neglect	1.11 (0.99–1.24) †	1.11 (1.01–1.22)*	1.02 (0.94–1.10)
Physical neglect	1.07 (0.87–1.32)	1.24 (1.01–1.52)*	1.16 (0.99–1.34)†
Multimaltreatment	1.18 (0.69–2.02)	1.75 (1.06–2.88)*	1.51 (1.03–2.22)*
Life-threatening events	1.06 (0.73–1.56)	1.58 (1.07–2.33)*	1.48 (1.06–2.02)*

OR = odd ratio; CI = confidence interval. PE = 101.
[a] N: PE 0 = 50; 1–2 PE = 80; >2 PE = 101
† $.05 < p < .25$.
* $p < .05$
** $p < .01$.

Table 4
Univariate associations between trauma-related and substance-related variables and psychotic experience group status without paranoia[a].

	1-2 PE (vs. 0 PE) OR (CI)	>2 PE (vs. 0 PE) OR (CI)	>2 PE (vs. 1-2 PE) OR (CI)
Substance-related variables			
Lifetime marihuana use	2.28 (0.97–5.37)†	2.63 (0.95–7.32)†	1.15 (0.35–3.77)
Lifetime amphetamine use	1.54 (0.85–2.82)†	2.60 (1.29–5.25)**	1.68 (0.79–3.61)†
Lifetime cocaine use	2.13 (1.13–4.01)*	2.25 (1.12–4.54)*	1.06 (0.51–2.21)
Past year intense marihuana use	1.47 (0.78–2.76)†	2.12 (1.00–4.49)†	1.44 (0.63–3.29)
Past year intense amphetamines use	2.18 (1.08–4.38)*	2.47 (1.15–5.29)*	1.14 (0.52–2.47)
Past year intense cocaine use	2.17 (0.88–5.33)†	2.01 (0.74–5.45)†	0.93 (0.35–2.47)
Trauma-related variables			
Emotional abuse	1.03 (0.95–1.12)	1.06 (0.96–1.17)	1.02 (0.92–1.12)
Physical abuse	1.05 (0.95–1.15)	0.96 (0.84–1.11)	0.92 (0.80–1.06)†
Sexual abuse	1.07 (0.84–1.36)	1.06 (0.82–1.37)	0.99 (0.73–1.34)
Emotional neglect	1.03 (0.94–1.11)	1.02 (0.93–1.11)	1.00 (0.91–1.10)
Physical neglect	1.02 (0.88–1.19)	1.16 (1.01–1.34)*	1.15 (0.98–1.35)†
Multimaltreatment	1.20 (0.84–1.72)	1.20 (0.79–1.80)	0.99 (0.64–1.52)
Life-threatening events	1.15 (0.83–1.59)	1.61 (1.13–2.29)**	1.47 (0.99–2.19)†

PE = 49; CI = confidence interval, OR = odd ratio.
[a] N: PS 0 = 113; 1-2 PS = 69; >2 = 49
† .05 < p < .25.
* p < .05.
** p < .01.

3.5. Combined trauma-related and substance-related variables by PE group status

3.5.1. Including paranoia-related experiences. Table 5 shows the best fitting models for PE group status when adjusting for age, SES and origin. When simultaneously introducing substance-related and trauma-related variables into the equation, >2 PE vs. 1–2 PE group status was best predicted by past year intense marihuana use and emotional abuse. When compared to 0 PE, >2 PE group status was only predicted by trauma-related variables.

3.5.2. Excluding paranoia-related experiences. Compared to 0 PE, >2 PE was best predicted by both lifetime amphetamine use and life-threatening events (statistical details available upon request). Excluding paranoia-related items, none but one of the trauma-related variables listed in Table 5 added to the prediction of PE groups status, which may suggest that paranoia-related symptoms themselves are mainly associated with trauma. In order to further explore this possibility, univariate logistic regression analyses were conducted with substance-related and trauma-related variables as independent variables and having *any paranoia-related experience* (cf. Table 1) as dependent variable. Not one substance-related variable was significantly associated with having paranoia-related symptom, while emotional abuse, physical abuse, emotional neglect and life-threatening events were significantly positively associated with paranoia-related symptomatology. After building a best fit model, emotional abuse appeared as the main significant predictor (available upon request).

Table 5
Best fitting models for each intergroup comparison for both trauma-related and substance-related variables (adjusted).

	B	OR (CI)
0 PS vs. >2 PS[a]		
Emotional abuse	.21	1.23 (1.03–1.46)*
Physical neglect	.60	1.82 (1.22–2.74)**
Life-threatening events	1.26	3.51 (1.90–6.48)**
1–2 PS vs. >2 PS[b]		
Emotional abuse	.16	1.18 (1.06–1.31)**
Past year intense marihuana use	1.03	2.79 (1.35–5.78)**

[a] N = 136 (incl. 7 outliers); Nagelkerke R^2 = .43.
[b] N = 168 (incl. 0 outliers); Nagelkerke R^2 = .17.
* Significant at p < .05.
** Significant at p < .01.

4. Discussion

The current study examined the prevalence of psychotic experiences in detained male adolescents, and its relation with trauma-related and substance-related variables with and without including paranoia-related psychotic experiences.

4.1. Prevalence of psychotic experiences

With regard to the first research question, more than 50% (i.e. 78%) of detained male adolescents reported at least one psychotic experience, even when paranoia-related experiences were not taken into account (i.e. 51%). This high rate suggests that psychotic experiences are more prevalent among detained juveniles than community youth (Dhossche et al., 2002; Lataster et al., 2006; Poulton et al., 2000) and call for increased attention, in particular because there is evidence for continuity from self-reported psychotic experiences in childhood to schizophreniform disorders in young adulthood (Poulton et al., 2000). However, the much lower rate of formal psychotic disorders as reported in these youths (Gosden et al., 2003; Teplin et al., 2002) and the current study finding that 9% of participants' psychotic experiences were indicative of a psychotic disorder (cf research question two), suggest that psychotic experiences may well be explained by other conditions. Similarly, a recent general population study found that 57% of adolescents with psychotic experiences endorse poor mental health, concluding that psychotic experiences may be considered non-specific markers of poor mental health (Nishida et al., 2008). In our study, 88% of participants with psychotic experiences met criteria for a psychiatric disorder. This finding is also in line with what was expected (cf research question two). As it has previously been suggested that psychotic experiences in detained youth may be related to substance use and a history of trauma, these conditions were investigated as explaining correlates.

4.2. Substance-related variables and psychotic experiences

With regard to the third research question, the current finding of marihuana use as a unique substance-related predictor of psychotic

symptomatology is interesting when considering the evidence that regular marihuana use in adolescence may be associated with an increased risk for psychotic experiences (Arseneault et al., 2002; Fergusson et al., 2005). This finding is of particular interest since frequent and heavy marihuana use occurs almost universally among detained adolescents (Perkonigg et al., 1999; Wong et al., 1997). The current move to liberalize and/or legalize the use of marihuana in European countries may therefore be questioned (Zammit et al., 2002). In addition, as methamphetamine can induce hallucinations and paranoia ideation (McKetin et al., 2006), it is rather surprising that amphetamine-related variables only became significantly associated with psychotic symptomatology when paranoia-related beliefs were excluded (cf research question five). In line with previous research (Reilly et al., 1998), the current study suggest that marihuana use in detained boys is particularly associated with paranoia-related psychotic experiences, while amphetamine use may be particularly related to hallucinations.

4.3. Trauma-related variables and psychotic experiences

In line with recent population based studies, the current study suggest that the risk of experiencing psychotic experiences is increased to those exposed to trauma (Bebbington et al., 2004; Janssen et al., 2004; Spauwen et al., 2006; Whitfield et al., 2005) (cf. research question three). More in particular, the current study demonstrates an association between psychotic symptomatology and emotional abuse when paranoia-related symptoms were taken into consideration. This finding is consistent with cognitive psychological theories about the development of psychotic experiences. Childhood emotional abuse has been found to damage self-representation (Finzi-Dottan and Karu, 2006), causing individuals to believe that other people are hostile and threatening, which may then trigger the onset and maintenance of psychotic experiences (Johns et al., 2004). Support for this theory stems from a recent study that found that negative schematic beliefs about others are particularly associated with paranoia-related symptoms (Gracie et al., 2007). However, because mapping the relationship between specific types of abuse/neglect and specific types of psychotic experiences is still in its infancy, further research is warranted (Kilcommons and Morrison, 2005; Read et al., 2003). In addition, further investigation on this type of maltreatment is warranted because emotional abuse may have more damaging effects than sexual or physical abuse (Chapman et al., 2004; Kaplan et al., 1999). While most research has focused on the impact of abuse (Bernstein et al., 2003), the current study indicates that screening for a history of emotional and physical neglect may be important because the outcomes associated with neglect may differ from those associated with abuse. The current study could not replicate the often reported relationship between physical/sexual abuse and psychotic symptomatology (Read et al., 2003; Shevlin et al., 2007), possibly due to the low prevalence rates or underreporting of these types of abuse in the current sample (Cohen et al., 1996).

4.4. Both trauma-related and substance-related variables and psychotic experiences

In order to address the fourth research question, both trauma-related and substance-related variables were introduced into the equation. More trauma-related variables appeared to be related to psychotic experiences than were substance-related variables. This preponderance of trauma-related over substance-related variables could indicate that trauma is an early and stronger risk factor for having psychotic experiences in adolescence than substance use. The cross-sectional nature of the current study does however not allow to investigate whether substance use is a mediator in the relation between trauma and psychotic experiences or whether substance use is merely a consequence of or a non-functional coping strategy to deal with trauma and/or psychotic symptomatology (Bak et al., 2005). Furthermore, the evidence that childhood trauma causes psychotic experiences and psychotic disorder is still controversial and a number of conceptual and methodological issues must be addressed before firm conclusion can be drawn (Morgan and Fisher, 2007). Longitudinal research is needed in order to examine the developmental pathway from traumatic experiences and/or substance use to psychotic symptomatology and psychotic disorder. Finally, studies in the general population suggest that psychotic experiences differ in quantitative ways from normal experiences and behaviors. Consequently, two persons at different positions on the continuum may experience differences in the number of symptoms, and the person at the highest position may have a higher risk of developing functional impairments and need for care (Johns and van Os, 2001). Furthermore, it is suggested that, rather than a true linear relationship between psychotic experiences and psychotic disorder, there exist a continuum-threshold. Beyond this threshold the risk of psychosis increases exponentially (Johns and van Os, 2001). This could explain why only individuals with more than two psychotic experiences had a significant higher risk to have a history of trauma and substance use compared with the other psychotic experience groups.

4.5. Clinical implications

The data presented here call for increased attention to the screening and diagnosis of psychotic disorders and experiences among detained and incarcerated juveniles. First, early detection of psychotic experiences is important in order to reduce the duration of untreated psychosis (Vreugdenhil et al., 2004), especially because functional outcome seems to decline substantially even after very short treatment delays (Harrigan et al., 2003). Second, although psychotic experiences do not necessarily have to be pathological (Sareen et al., 2005), the association between trauma exposure and substance use on the one hand, and psychotic symptomatology on the other hand, highlights the importance of systematically ascertaining trauma histories and substance use in juvenile justice youth. This may particularly be relevant for juvenile offenders with more than two self-reported psychotic experiences. Third, traumatized individuals who report psychotic experiences were shown to be more likely to use non-functional coping strategies (Bak et al., 2005). Because substance use might be an example of non-functional coping, and given the evidence that substance use is associated with psychotic experiences, stimulating more functional coping resources may deter psychosis development and improve general functioning (Bak et al., 2005). However, as some researchers did not find evidence for this “self-medication” theory (Fergusson et al., 2005), the need for longitudinal research is underscored again.

The results of the present study should be viewed in the light of some limitations. First, in order to compare prevalence rates of psychotic symptomatology with findings from other studies in detained adolescents, participants were asked whether or not they experienced a particular psychotic experience. Consequently, we did not account for the clinical significance, frequency, and intensity. Furthermore, we could not exclude false positive endorsement of psychotic experiences due to respondent understanding. However, self-reported psychotic experiences without considering severity and frequency were found to have a risk profile that is similar to and predicts future clinical psychotic disorder (Mojtabai, 2006; Poulton et al., 2000). Second, because of the low prevalence of subjects having PTSD the current study could not address the hypothesis that psychotic experiences may constitute part of this

disorder, as suggested for detained youth (Vermeiren et al., 2006) and demonstrated in a population study (Sareen et al., 2005). Third, the cross-sectional nature of the study did not allow us to make any causal interpretation. Fourth, as polysubstance use is common among juvenile detainees (McClelland et al., 2004), as well as in our sample, it was not possible to disentangle the independent contribution of each substance. Fifth, given the specific nature of our sample (i.e. detained male adolescents), further research should determine whether our findings are generalizable beyond the sample studied thus far (e.g. detained female adolescent, adolescents in the general population).

Conflict of interest

There are no conflicts of interest to declare.

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References

Arseneault, L., Cannon, M., Poulton, R., Murray, R., Caspi, A., Moffitt, T.E., 2002. Cannabis use in adolescence and risk for adult psychosis: longitudinal prospective study. Br. Méd. J. 325, 1212–1213.

Atkins, D., Pumariega, A., Rogers, K., 1999. Mental disorders and incarcerated youth: prevalence and nature of psychopathology. J. Child. Fam. Stud. 8, 193–204.

Bak, M., Krabbendam, L., Janssen, I., de Graaf, R., Vollebergh, W., van Os, J., 2005. Early trauma may increase the risk for psychotic experiences by impacting on emotional response and perception of control. Acta Psychiatrica Scandinavica 112, 360–366.

Bebbington, P.E., Bhugra, D., Brugha, T., Singleton, N., Farrell, M., Jenkins, R., Lewis, G., Meltzer, H., 2004. Psychosis, victimisation and childhood disadvantage – evidence from the second British National Survey of Psychiatric Morbidity. Br. J. Psychiatry 185, 220–226.

Bernstein, D.P., Stein, J.A., Newcomb, M.D., Walker, E., Pogge, D., Ahluvalia, T., Stokes, J., Handelsman, L., Medrano, M., Desmond, D., Zule, W., 2003. Development and validation of a brief screening version of the Childhood Trauma Questionnaire. Child. Abus. Negl. 27, 169–190.

Chapman, D.P., Whitfield, C.L., Felitti, V.J., Dube, S.R., Edwards, V.J., Anda, R.F., 2004. Adverse childhood experiences and the risk of depressive disorders in adulthood. J. Affect. Disord. 82, 217–225.

Cohen, Y., Spirito, A., Sterling, C., Donaldson, D., Seifer, R., Plummer, B., Avila, R., Ferrer, K., 1996. Physical and sexual abuse and their relation to psychiatric disorder and suicidal behavior among adolescents who are psychiatrically hospitalized. J. Child Psychol. Psychiatry 37, 989–993.

Colins, O., Vermeiren, R., Schuyten, G., Broekaert, E., Psychiatric disorders in detained juvenile male delinquents by violent and non-violent index offending, in press.

Crimmins, S.M., Cleary, S.D., Brownstein, H.H., Spunt, B.J., Warley, R.M., 2000. Trauma, drugs and violence among juvenile offenders. J. Psychoact. Drugs 32, 43–54.

De Bellis, M.D., 2002. Developmental traumatology: a contributory mechanism for alcohol and substance use disorders. Psychoneuroendocrinology 27, 155–170.

Dhossche, D., Ferdinand, R., Van Der Ende, J., Hofstra, M.B., Verhulst, F., 2002. Diagnostic outcome of self-reported hallucinations in a community sample of adolescents. Psycholog. Med. 32, 619–627.

Escher, S., Romme, M., Buiks, A., Delespaul, P., van Os, J., 2002. Formation of delusional ideation in adolescents hearing voices: a prospective study. Am. J. Med. Genet. 114, 913–920.

Fergusson, D.M., Horwood, L.J., Ridder, E.M., 2005. Tests of causal linkages between cannabis use and psychotic symptoms. Addiction 100, 354–366.

Finzi-Dottan, R., Karu, T., 2006. From emotional abuse in childhood to psychopathology in adulthood – a path mediated by immature defense mechanisms and self-esteem. J. Nerv. Ment. Disord. 194, 616–621.

Gosden, N.P., Kramp, P., Gabrielsen, G., Sestoft, D., 2003. Prevalence of mental disorders among 15–17-year-old male adolescent remand prisoners in Denmark. Acta Psychiatr. Scand. 107, 102–110.

Gracie, A., Freeman, D., Green, S., Garety, P.A., Kuipers, E., Hardy, A., Ray, K., Dunn, G., Bebbington, P., Fowler, D., 2007. The association between traumatic experience, paranoia and hallucinations: a test of the predictions of psychological models. Acta Psychiatrica Scandinavica 116, 280–289.

Haapasalo, J., Hamalainen, T., 1996. Childhood family problems and current psychiatric problems among young violent and property offenders. J. Am. Acad. Child Adolesc. Psychiatry 35, 1394–1401.

Hanssen, M., Bak, M., Bijl, R., Vollebergh, W., van Os, J., 2005. The incidence and outcome of subclinical psychotic experiences in the general population. Br. J. Clin. Psychol. 44, 181–191.

Harrigan, S.M., McGorry, P.D., Krstev, H., 2003. Does treatment delay in first-episode psychosis really matter? Psycholog. Med. 33, 97–110.

Henquet, C., Krabbendam, L., Spauwen, J., Kaplan, C., Lieb, R., Wittchen, H.U., van Os, J., 2005. Prospective cohort study of cannabis use, predisposition for psychosis, and psychotic symptoms in young people. Eur. Neuropsychopharmacol. 16, S381–S1381.

Hollander, H.E., Turner, F.D., 1985. Characteristics of incarcerated delinquents – relationship between development disorders, environmental and family factors, and patterns of offense and recidivism. J. Am Acad. Child Adolesc. Psychiatry 24, 221–226.

Homer, D., Lemeshow, S., 2000. Applied Logistic Regression. John Wiley and Sons, New york.

Janssen, I., Hanssen, M., Bak, M., Bijl, R.V., de Graaf, R., Vollebergh, W., McKenzie, K., van Os, J., 2003. Discrimination and delusional ideation. Br. J. Psychiatry 182, 71–76.

Janssen, I., Krabbendam, L., Bak, M., Hanssen, M., Vollebergh, W., de Graaf, R., van Os, J., 2004. Childhood abuse as a risk factor for psychotic experiences. Acta Psychiatr Scand 109, 38–45.

Johns, L.C., Cannon, M., Singleton, N., Murray, R.M., Farrell, M., Brugha, T., Bebbington, P., Jenkins, R., Meltzer, H., 2004. Prevalence and correlates of self-reported psychotic symptoms in the British population. Br. J. Psychiatry 185, 298–305.

Johns, L.C., van Os, J., 2001. The continuity of psychotic experiences in the general population. Clin. Psycholog. Rev. 21, 1125–1141.

Kaplan, S.J., Pelcovitz, D., Labruna, V., 1999. Child and adolescent abuse and neglect research: a review of the past 10 years. Part I: Physical and emotional abuse and neglect. J. Am. Acad. Child Adolesc. Psychiatry 38, 1214–1222.

Kilcommons, A.M., Morrison, A.P., 2005. Relationships between trauma and psychosis: an exploration of cognitive and dissociative factors. Acta Psychiatr Scand 112, 351–359.

Lataster, T., van Os, J., Drukker, M., Henquet, C., Feron, F., Gunther, N., Myin-Germeys, I., 2006. Childhood victimisation and developmental expression of non-clinical delusional ideation and hallucinatory experiences – victimisation and non-clinical Psychotic experiences. Soc. Psychiatry Psychiatr. Epidemiol. 41, 423–428.

McClelland, G.M., Elkington, K.S., Teplin, L.A., Abram, K.M., 2004. Multiple substance use disorders in juvenile detainees. J. Am. Acad. Child Adolesc. Psychiatry 43, 1215–1224.

McKetin, R., McLaren, J., Lubman, D.I., Hides, L., 2006. The prevalence of psychotic symptoms among methamphetamine users. Addiction 101, 1473–1478.

McManus, M., Alessi, N.E., Grapentine, W.L., Brickman, A., 1984. Psychiatric Disturbance in Serious Delinquents. J. Am. Acad Child Adolesc. Psychiatry 23, 602–615.

Mojtabai, R., 2006. Psychotic-like experiences and interpersonal violence in the general population. Soc. Psychiatry Psychiatr. Epidemiol. 41, 183–190.

Morgan, C., Fisher, H., 2007. Environment and schizophrenia: environmental factors in schizophrenia: childhood trauma – a critical review. Schizophrenia Bulletin 33, 3–10.

Nishida, A., Tanii, H., Nishimura, Y., Kajiki, N., Inoue, K., Okada, M., Sasaki, T., Okazaki, Y., 2008. Associations between psychotic-like experiences and mental health status and other psychopathologies among Japanese early teens. Schizophrenia Research 99, 125–133.

Perkonigg, A., Lieb, R., Hofler, M., Schuster, P., Sonntag, H., Wittchen, H.U., 1999. Patterns of cannabis use, abuse and dependence over time: incidence, progression and stability in a sample of 1228 adolescents. Addiction 94, 1663–1678.

Poulton, R., Caspi, A., Moffitt, T.E., Cannon, M., Murray, R., Harrington, H., 2000. Children's self-reported psychotic symptoms and adult schizophreniform disorder – a 15-year longitudinal study. Arch. Gen. Psychiatr. 57, 1053–1058.

Read, J., Agar, K., Argyle, N., Aderhold, V., 2003. Sexual and physical abuse during childhood and adulthood as predictors of hallucinations, delusions and thought disorder. Psycholog. Psychother. – Theory Res. Pract. 76, 1–22.

Read, J., van Os, J., Morrison, A.P., Ross, C.A., 2005. Childhood trauma, psychosis and schizophrenia: a literature review with theoretical and clinical implications. Acta Psychiatr Scand 112, 330–350.

Reilly, D., Didcott, P., Swift, W., Hall, W., 1998. Long-term cannabis use: characteristics of users in an Australian rural area. Addiction 93, 837–846.

Richards, I., 1996. Psychiatric disorder among adolescents in custody. Aust. N. Z. J. Psychiatry 30, 788–793.

Ross, C.A., Anderson, G., Clark, P., 1994. Childhood abuse and the positive symptoms of schizophrenia. Hosp. Community Psychiatry 45, 489–491.

Sareen, J., Cox, B.J., Goodwin, R.D., Asmundson, G.J.G., 2005. Co-occurrence of posttraumatic stress disorder with positive psychotic symptoms in a nationally representative sample. J. Trauma Stress 18, 313–322.

Shaffer, D., Fisher, P., Lucas, C.P., Dulcan, M.K., Schwab-Stone, M.E., 2000. NIMH diagnostic interview schedule for children version IV (NIMH DISC-IV): description, differences from previous versions, and reliability of some common diagnoses. J. Am. Acad. Child Adolesc. Psychiatry 39, 28–38.

Shevlin, M., Dorahy, M.J., Adamson, G., 2007. Trauma and psychosis: an analysis of the National Comorbidity Survey. Am. J. Psychiatry 164, 166–169.

Spauwen, J., Krabbendam, L., Lieb, R., Wittchen, H.U., van Os, J., 2006. Impact of psychological trauma on the development of psychotic symptoms: relationship with psychosis proneness. Br. J. Psychiatry 188, 527–533.

Teplin, L.A., Abram, K.M., McClelland, G.M., Dulcan, M.K., Mericle, A.A., 2002. Psychiatric disorders in youth in juvenile detention. Arch. Gen. Psychiatry 59, 1133–1143.

Thirthalli, J., Benegal, V., 2006. Psychosis among substance users. Curr. Opin. Psychiatry 19, 239–245.

Ulzen, T.P.M., Hamilton, H., 1998. The nature and characteristics of psychiatric comorbidity in incarcerated adolescents. Can. J. Psychiatry 43, 57–63.

van Os, J., Hanssen, M., Bijl, R.V., Ravelli, A., 2000. Strauss (1969) revisited: a psychosis continuum in the general population? Schizophrenia Research 45, 11–20.

Veling, W., Selten, J.P., Mackenbach, J.P., Hoek, H.W., 2007. Symptoms at first contact for psychotic disorder: comparison between native Dutch and ethnic minorities. Schizophrenia Research 95, 30–38.

Vermeiren, R., Jespers, I., Moffitt, T., 2006. Mental health problems in juvenile justice populations. Child Adolesc. Psychiatr Clin. N. Am. 15, 333-+.

Vreugdenhil, C., Van den Brink, W., Wouters, L., Doreleijers, T.A.H., 2003. Substance use, substance use disorders, and comorbidity patterns in a representative sample of incarcerated male Dutch adolescents. J. Nerv. Ment. Dis. 191, 372–378.

Vreugdenhil, C., Vermeiren, R., Wouters, L., Doreleijers, T.A.H., van den Brink, W., 2004. Psychotic symptoms among male adolescent detainees in the Netherlands. Schizophr. Bull. 30, 73–86.

Wenar, C., Kerig, P., 2006. Developmental Psychopathology. From Infancy through Adolescence. McGraw-Hill International edition.

Whitfield, C.L., Dube, S.R., Felitti, V.J., Anda, R.F., 2005. Adverse childhood experiences and hallucinations. Child Abuse Neglect 29, 797–810.

Wong, C.S.Y., Tang, C.S.K., Schwarzer, R., 1997. Psychosocial correlates of substance use: comparing high school students with incarcerated offenders in Hong Kong. J. Drug Educ. 27, 147–172.

Yoshinaga, C., Kadomoto, I., Otani, T., Sasaki, T., Kato, N., 2004. Prevalence of post-traumatic stress disorder in incarcerated juvenile delinquents in Japan. Psychiatry Clin. Neurosci. 58, 383–388.

Zammit, S., Allebeck, P., Andreasson, S., Lundberg, I., Lewis, G., 2002. for schizophrenia in Swedish conscripts of 1969: historical cohort study. Br. Méd. J. 325, 1199–1201.