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Self-reported suicidal ideation among individuals with first episode psychosis and healthy controls: Findings from the international multicentre EU-GEI study

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ABSTRACT

Introduction: Suicidal ideation is common among individuals with first episode psychosis (FEP), with prevalence estimates up to 56.5 %. Despite its high prevalence, relatively little is known about how sociodemographic, clinical and/or developmental characteristics contribute to the experience of suicidal ideation in individuals with FEP.

Methods: In this cross-sectional study (FEP n = 551 and controls n = 857), univariate logistic regression analyses were performed to study the associations of sociodemographic, clinical, and developmental factors with suicidal ideation in individuals with FEP as well as controls. Suicidal ideation was assessed using the Community Assessment of Psychic Experiences (CAPE). In addition, multivariate logistic regression analyses were conducted based on a stepwise approach.

Results: In FEP, only depressive symptoms remained significantly associated with suicidal ideation when all correlates were integrated into one model. In the multivariate model in controls, depressive symptoms, positive symptoms, and traumatic childhood experiences were significantly associated with suicidal ideation.

Conclusions: This study showed that depressive symptoms are an important factor relating to suicidal ideation in individuals with FEP, over and above other clinical, sociodemographic, and developmental factors. This underscores the relevance of screening for suicidal ideation in individuals with FEP, and highlights the need for a better understanding of the diagnostic uncertainty and course of mood symptoms in early psychosis.

Limitations: Cross-sectional study design, self-reported questionnaires.

1. Introduction

Recent studies show a 60 % risk elevation for suicide in individuals with first-episode psychosis (FEP) within the first year of treatment as compared to later stages of illness (Bertelsen et al., 2007; Bornheimer et al., 2021; Nordentoft et al., 2015; Pompili et al., 2011a; Ventriglio et al., 2016). This increased risk for suicide at illness onset in individuals across the psychosis vulnerability spectrum has been confirmed by many studies (Ayesa-Arriola et al., 2015; Barrett et al., 2010a, 2015; Bertelsen et al., 2007; Bornheimer et al., 2021; Challis et al., 2013; Clarke et al., 2006; Coentre et al., 2017, 2021; Dutta et al., 2010; Lopez-Morinigo et al., 2019; Madsen et al., 2016; Madsen and Nordentoft, 2012; Nordentoft et al., 2002, 2015; Palmer et al., 2005; Pelizza et al., 2021; Pompili et al., 2011b; Robinson et al., 2010; Togay et al., 2015; Ventriglio et al., 2016). The prevalence of attempted suicide in individuals with FEP ranges from 8.5 % to 31 % (Coentre et al., 2017; Pelizza et al., 2021; Togay et al., 2015), and suicide accounts for 2 % to 5 % of deaths in individuals with FEP in long-term follow up studies (Bertelsen et al., 2007; Coentre et al., 2017; Dutta et al., 2010; Palmer et al., 2005). Moreover, suicidal ideation occurs frequently among individuals with FEP with an estimated prevalence of 26 % to 56.5 % (Barrett et al., 2010a; Bornheimer, 2019; Madsen et al., 2016; Nordentoft et al., 2002; Pelizza et al., 2021).

Suicidal ideation is seen as a critical initial step along a continuum of increasing severity toward attempted and completed suicide (Kontaxakis et al., 2004). Moreover, previous literature suggested that a better understanding of factors associated with suicidal ideation could improve suicide prevention (Mann et al., 1999). Given the substantial risk for suicide among individuals with FEP (Ayesa-Arriola et al., 2015; Barrett et al., 2010a, 2010b, 2015; Bertelsen et al., 2007; Bornheimer et al., 2021; Challis et al., 2013; Clarke et al., 2006; Coentre et al., 2017, 2021; Dutta et al., 2010; Lopez-Morinigo et al., 2019; Madsen et al., 2016; Madsen and Nordentoft, 2012; Nordentoft et al., 2002, 2015; Palmer et al., 2005; Pelizza et al., 2021; Pompili et al., 2011b; Robinson et al., 2010; Togay et al., 2015; Ventriglio et al., 2016), there remains critical interest in studying factors that are possibly associated with suicidal ideation at illness onset. While factors associated with suicidal ideation and behaviour have been demonstrated to play a role among individuals with a schizophrenia spectrum disorder (Barrett et al., 2011; Bornheimer, 2016; Bornheimer et al., 2021; Delaney et al., 2012; Montross et al., 2005; Stip et al., 2017; Villa et al., 2018), limited evidence exists regarding factors associated with suicidal ideation in individuals with FEP, and previous findings have been heterogeneous (Bornheimer et al., 2021; Chang et al., 2014; Coentre et al., 2021).

The most consistent factors associated with suicidal ideation and behaviour among individuals with FEP are previous suicide attempts (Ayesa-Arriola et al., 2015; Barrett et al., 2010b, 2015; Bertelsen et al., 2007; Clarke et al., 2006; Coentre et al., 2021; Nordentoft et al., 2002), younger age at time of onset of the first psychotic episode (Coentre et al., 2021), substance abuse (Coentre et al., 2021), longer duration of untreated psychosis (DUP) (Barrett et al., 2015; Clarke et al., 2006), the co-occurrence of depressive symptoms (Bakst et al., 2010; Barrett et al., 2015; Bertelsen et al., 2007; Bornheimer, 2019; Bornheimer et al., 2021; Chang et al., 2014; Madsen and Nordentoft, 2012; Nordentoft et al., 2002; Sanchez-Gistau et al., 2015), and awareness of illness (Amador et al., 1996; Massons et al., 2017; Patelaros et al., 2015). Results are inconsistent regarding gender (Austad et al., 2015; Barrett et al., 2010b; Clarke et al., 2006; Foley et al., 2008; Melle et al., 2010; Mork et al., 2012; Nordentoft et al., 2002; Robinson et al., 2010), and cognitive ability (Barrett et al., 2010b, 2015; Bornheimer et al., 2021; Foley et al., 2008; Hawton et al., 2005; Lopez-Morinigo et al., 2019; Robinson et al., 2009). Although previous research found no consistent association between positive symptoms and suicidal ideation (Bertelsen et al., 2007; Challis et al., 2013; Chang et al., 2014; Nordentoft et al., 2002; Pompili et al., 2011b), there is growing evidence that positive symptoms, especially hallucinations and delusions, could be associated with suicidal ideation among individuals with FEP (Bornheimer, 2019; Bornheimer et al., 2021; Bornheimer and Jaccard, 2017; Grover et al., 2022; Yates et al., 2019). In contrast, better treatment compliance and more negative symptoms are associated with lower suicidal ideation and behaviour among individuals with FEP (Chang et al., 2014; Fenton et al., 1997; Gomez-Duran et al., 2014; Grover et al., 2022; Hor and Taylor, 2010; Huang et al., 2018; Kjelby et al., 2015; Seeman, 2017; Tarrier et al., 2007; Ventriglio et al., 2016).

Given these heterogeneous findings, relatively small sample sizes, and very few studies investigating a broad range and interdependency of risk factors (Bertelsen et al., 2007; Chang et al., 2014; Nordentoft et al., 2002), more research is warranted to identify factors associated with suicidal ideation among individuals with FEP. Accordingly, this study investigated whether sociodemographic characteristics, presence of childhood trauma, social and academic functioning, and severity of symptoms were associated with suicidal ideation in a large sample of FEP patients across Europe. In addition, we studied healthy controls to assess whether there are differences in observed associations between individuals with FEP and non-affected individuals.

2. Material and methods

2.1. Study design and sample

The current study has a cross-sectional design and is part of the European network of national schizophrenia networks studying Gene-Environment Interactions (EU-GEI) (Jongsma et al., 2018). Between 2010 and 2015, individuals with a first episode of non-organic psychotic disorders according to the ICD-10 (Jongsma et al., 2018; Quattrone et al., 2019) were identified across six countries to examine incidence rates of psychotic disorders and patterns of symptomatology (Jongsma et al., 2018). In addition, population controls were recruited (see Supplemental Table 1 for a more detailed description). An extensive face-to-face assessment was conducted on 1130 individuals with FEP and 1497 population controls, broadly representative of the FEP population living in each catchment area in terms of age, gender and ethnic group (Jongsma et al., 2018).

2.2. Participants

Individuals with FEP were included when they were aged between 18 and 64 years old, had a clinical diagnosis for an untreated FEP (ICD-10) codes F20-F33 and were residing within the catchment area at the time of consent to participate in the study (Supplemental Table 1). Individuals with any previous contact with psychiatric services for psychosis, psychotic symptoms with any evidence of organic causation and/or transient psychotic symptoms resulting from acute intoxication (ICD-10: F1x.5) were excluded. Controls were healthy participants aged between 18 and 64 years, with no current or past psychotic disorder, residing within the catchment area at the time of consent into the study. For detailed in- and exclusion criteria and information on recruitment for both individuals with FEP and healthy controls, see the protocol paper (Gayer-Anderson et al., 2020).

2.3. Ethical approval

All participants who agreed to take part in the study provided informed, written consent following full explanation of the study (Gayer-Anderson et al., 2020). Ethical approval for the study was provided by local research ethics committees in each of the study sites (Gayer-Anderson et al., 2020; Szöke et al., 2017).

2.4. Measurements

2.4.1. Sociodemographic characteristics, substance and medication use

Case and control characteristics included age, gender, ethnicity, social class, level of education, relationship status, migrant status, cannabis use, psychiatric family history and medication use (Gayer-Anderson et al., 2020). Data on age, gender, ethnicity, social class, level of education, relationship status and migrant status was collected using a modified version of the Medical Research Council Sociodemographic Schedule (Gayer-Anderson et al., 2020; Mallet, 1997). Ethnicity was collected through a self-reported questionnaire (Gayer-Anderson et al., 2020; Mallet, 1997). A modified version of the Cannabis Experience Questionnaire ($CEQ_{EU\text{-}GEI}$), was used to collect information on cannabis use (Di Forti et al., 2019). Family history of mental illness in first degree relatives was obtained through the Family Interview for genetic studies (Kirkbride et al., 2017). Present medication usage was obtained via a medication list (Gayer-Anderson et al., 2020).

2.4.2. The Community Assessment of Psychic Experiences (CAPE)

Dimensions of psychotic symptomatology were measured using the Community Assessment of Psychic Experiences (CAPE) (Gayer-Anderson et al., 2020; Stefanis et al., 2002). The CAPE was administered to both individuals with FEP and control individuals. The CAPE is a self-reported questionnaire that rates lifetime psychotic experiences in the affective and non-affective domains on a dimensional four-point scale from: never (1); sometimes (2); often (3); to nearly always (4). The CAPE results in three subscale scores for positive, negative and depressive symptoms (Konings et al., 2006). Lifetime suicidal ideation was measured with CAPE item no. 14 ("do not want to live anymore") and scored on a four-point scale from never (1); sometimes (2); often (3); to nearly always (4). This item was recoded as a dichotomous variable; no suicidal ideation (score of 1) versus the presence of suicidal ideation (scores $\geq$2). CAPE item 14 was excluded from calculation of the depressive symptom subscale score, in order to test suicidal ideation independently from the total score.

2.4.3. Premorbid adjustment scale (PAS) (shortened version)

Social and academic functioning were assessed using the premorbid adjustment scale (PAS) (shortened version) (Cannon-Spoor et al., 1982). The PAS shortened version includes rating scales on five domains: sociability and withdrawal, peer relationships, scholastic performance, adaptation to school and social-sexual aspects of life. The PAS covered two life periods: childhood to 12 years old and early adolescence from 12 to 16 years old. In the current study, only the PAS childhood total score was included as a potential correlate.

2.4.4. Childhood trauma questionnaire (CTQ)

Traumatic experiences in childhood were assessed using the Childhood Trauma Questionnaire (CTQ). The CTQ is a retrospective, self-report measure that was developed to provide a brief, reliable, and valid assessment of a broad range of traumatic experiences in childhood; physical, emotional, and sexual abuse and physical and emotional neglect, as well as related aspects of the child-rearing environment (Bernstein and Fink, 1997; Bernstein et al., 1994). The total trauma score (total CTQ sum score) was included as potential correlate in the current study.

2.5. Missing data

In total, 1130 cases and 1497 controls were enrolled in the EUGEI study, of which 551 cases and 857 controls were analysed in the current study (Supplemental Fig. 1). Cases and controls without data for suicidal ideation were excluded from analyses. In addition, we conducted complete case regression analyses and included a sample with data availability for all variables. Imputation was considered less appropriate since some variables had >20 % missing data.

2.6. Statistical analysis

Characteristics between individuals with FEP and control individuals were compared using χ^2 tests for categorical variables and Mann-Whitney *U* test for non-normally distributed, continues variables. In addition, means and proportions were calculated. Two tailed *p*-values $<$ 0.05 were taken as a cut-off for statistical significance.

To investigate whether self-reported, lifetime suicidal ideation was associated with sociodemographic characteristics, clinical symptoms and/or developmental milestones binary logistic regression analyses were conducted. Variables were checked for distribution/skewness and multicollinearity. Ethnicity, main social class and current antipsychotic use were recoded as dichotomous variables, to facilitate interpretation. First, univariate binary logistic regressions analyses were performed to model the associations between individual correlates and presence of suicidal ideation in both groups separately. CAPE item 14a (suicidal ideation) dichotomized acted as dependent variable. The category "no suicidal ideation" was used as reference group in all analyses. In addition, based on the stepwise approach, a multivariate binary logistic regression was conducted with correlates with *p* values $<$ 0.10 from the univariate analyses. The Hosmer and Lemeshow goodness of fit test was used to assess goodness of fit of the multivariate binary logistic regression model. Significant correlates in the multivariate binary logistic

regression were identified using $p < 0.05$ as a cut-off for statistical significance. All statistical analyses were performed using SPSS version 26.

3. Results

3.1. Sociodemographic and clinical characteristics

Descriptive information of participants is presented in Table 1. Median age of the study population was 32.4 years for cases and 38.2 years for controls. 39 % of cases and 52 % of controls was female. 53 % of individuals with FEP and 24 % of healthy controls experienced suicidal ideation. CAPE positive, negative and depressive symptoms are presented in Table 1. Significant differences were observed between the case and control group for all characteristics, except for the variable migrant status (Table 1). For completeness, we included a table with case and control characteristics of the full sample (Supplemental Table 2). There were no differences when compared to Table 1, except for the variable migrant status. In the complete case sample control individuals were more often migrants, while in the original sample, individuals with FEP were more often migrants.

3.2. Main analysis

3.2.1. FEP

Significant associations in the univariate binary logistic regression analyses (n = 551) were found between suicidal ideation and positive, negative and depressive symptoms, and traumatic childhood experiences (CTQ total score). Subsequent, the multivariate binary logistic regression showed a significant association for depressive symptoms only (χ^2 (1) = 32.07, $p < 0.001$), demonstrating that individuals with FEP with more depressive symptoms report more suicidal ideation over and above other sociodemographic and clinical factors, social and academic functioning in childhood or presence of childhood trauma. The parameter estimates of the univariate and multivariate model are shown in table 2. The multivariate binary logistic regression model demonstrated good fit based upon the non-significant Hosmer and Lemeshow test (χ^2 (8) = 14.66, $p = 0.07$). When correlates were added to the null model, the model became significant: χ^2 (4) = 111.27, $p < 0.001$, pseudo-R^2 = 0.24 (Nagelkerke).

We conducted a sensitivity analysis contrasting cases with data available on suicidal ideation (n = 852) to cases without data available on suicidal ideation (n = 278) to assess whether there were differences in social, demographic or clinical characteristics between both groups. The sensitivity analysis showed that the group of cases without data on suicidal ideation more often had a non-white ethnicity, were more often migrants, more often employed, more often used cannabis, more often had a longer DUP, and more often had a higher CTQ total score compared to the group of cases with data availability on suicidal ideation (Supplemental Table 3).

3.2.2. Controls

In the univariate binary logistic regression analyses (n = 857), gender, no previous education, any depression in first degree relatives, positive symptoms, negative symptoms, depressive symptoms, traumatic childhood experiences and lower social and academic functioning in childhood (PAS childhood sum score) were associated with suicidal ideation in control individuals. In addition, a multivariate binary logistic regression was carried out with variables that were significantly associated with suicidal ideation in the univariate binary logistic regression analyses. The multivariate binary logistic regression demonstrated that depressive (χ^2 (1) = 54.33, $p < 0.001$) and positive symptoms (χ^2 (1) = 4.47, $p = 0.03$), together with traumatic childhood experiences (χ^2 (1) =

Table 1
Case and control characteristics.

		Cases (n = 551)	Controls (n = 857)	Between group statistics			
				χ^2	U	df	*p*
Age at assessment	Years; mean (SD)	32.42 (10.87)	38.22 (12.30)		170,142.00		0.00**
Female	n (%)	214 (38.84 %)	441 (51.46 %)	21.47		1	0.00**
Ethnicity	n (%)	376 (68.24 %)/175 (31.76 %)	653 (76.20 %)/204 (23.80 %)	10.79		1	0.00**
Migrant	n (%)	80 (14.52 %)	127 (14.82 %)	0.02		1	0.87
Long-term relationship	n (%)	389 (70.60 %)	793 (92.53 %)	119.73		1	0.00**
Educational level	Levels (n)	81 (14.70 %)/377 (68.42 %)/93 (16.88 %)	351 (40.96 %)/459 (53.56 %)/47 (5.48 %)	131.62		2	0.00**
Employment	n (%)	531 (96.37 %)	852 (99.42 %)	17.85		1	0.00**
History of mental illness in 1st degree relatives	n (%)	269 (48.82 %)	297 (34.66 %)	27.23		1	0.00**
Any depression in first degree relatives	n (%)	239 (43.38 %)	266 (31.04 %)	22.19		1	0.00**
Current cannabis use	n (%)	101 (18.33 %)	87 (10.15 %)	19.39		1	0.00**
Current antipsychotic use	n (%)	472 (85.66 %)	2 (0.23 %)	1096.03		1	0.00**
Suicidal ideation (CAPE item no. 14a)	n (%)	261 (47.37 %)/290 (52.63 %)	656 (76.55 %)/201 (23.45 %)	125.72		1	0.00**
Duration of untreated psychosis (DUP)	Weeks; mean (SD)	54.94 (154.62)					
Premorbid adjustment scale (PAS) (<12 years old) sum score	Scale; mean (SD)	6.73 (4.06)	4.36 (3.27)		152,401.00		0.00**
Childhood Trauma Questionnaire (CTQ) total score	Scale; mean (SD)	41.17 (13.02)	34.55 (11.05)		150,133.00		0.00**
CAPE dimensions							
CAPE subscale positive symptom sum score	Scale; mean (SD)	32.60 (9.75)	24.59 (3.96)		98,935.00		0.00**
CAPE subscale negative symptom sum score	Scale; mean (SD)	26.69 (8.10)	20.82 (5.01)		124,412.50		0.00**
CAPE subscale depressive symptom sum score	Scale; mean (SD)	14.20 (4.55)	11.73 (2.97)		156,188.50		0.00**

Legend: Ethnicity: white/non-white (black/mixed/Asian/north African/other); Educational level: higher education/school, college or vocational/no qualifications; Migrant status: yes; Long-term relationship: yes; Employment: yes; CAPE item no. 14a Do not want to live anymore: no/yes (dichotomous). Duration of untreated psychosis (DUP): date of first contact minus onset date in weeks. CAPE: Community Assessment of Psychotic Experiences; CAPE subscale positive symptom sum score: CAPE items 2-5-6-7-10-11-13-15-17-20-22-24-26-28-30-31-33-34- 41-42 (20 items). CAPE subscale negative symptom sum score: CAPE items 3-4-8-16-18-21-23-25-27-29-32-35-36-37 (14 items). CAPE subscale depressive symptom sum score: CAPE items 1-9-12-19-38-39-40 (7 items, item 14 excluded).
χ^2: chi-square test statistic; U: Mann Whitney U statistic; df: degrees of freedom; *p*: *p*-value: **p < 0.01; *p< 0.05.

Table 2
Correlates unique contributions in the binary logistic regression analyses.
DV = SI measured with cape item 14a.

Cases (n = 551)	Univariate					Multivariate				
	χ^2	df	*p*	OR	CI	χ^2	df	*p*	OR	CI
Age at assessment	0.00	1	0.97		0.98–1.02					
Gender (1)	2.14	1	0.14	1.29	0.92–1.83					
Ethnicity (1)	1.69	1	0.19	0.79	0.55–1.13					
Migrant (1)	0.57	1	0.45	0.83	0.52–1.34					
Long-term relationship (1)	3.00	1	0.08	1.38	0.96–2.00					
Education level (2)	0.00	2	0.96	0.98	0.54–1.79					
Main social class (1)	0.45	1	0.50	0.73	0.30–1.82					
Any depression in 1st degree relatives (1)	2.51	1	0.11	1.32	0.94–1.85					
Current cannabis use (1)	0.03	1	0.85	1.04	0.68–1.61					
Current AP use (1)	0.15	1	0.70	1.10	0.68–1.77					
Duration of untreated psychosis (DUP)	0.56	1	0.46		1.00–1.00					
Premorbid adjustment scale (PAS) (<12 years old) sum score	0.15	1	0.70		0.97–1.05					
Childhood Trauma Questionnaire (CTQ) total score	10.28	1	0.00**		1.01–1.04	0.01	1	0.91		0.99–1.02
CAPE positive psychotic symptoms sum score	32.84	1	0.00**		1.04–1.08	0.42	1	0.52		0.98–1.03
CAPE negative psychotic symptoms sum score	55.94	1	0.00**		1.08–1.14	1.03	1	0.31		0.98–1.06
CAPE depressive symptom sum score	79.26	1	0.00**		1.20–1.33	32.07	1	0.00**		1.14–1.31

Legend: Gender: 1 = male; 2 = female; Ethnicity: 1 = white; 2 = non-white; Migrant: 0 = no; 1 = yes; Long-term relationship: 0 = no; 1 = yes; Educational level: 0 = higher education; 1 = school, college, vocational; 2 = no qualifications; Main social class: 0 = unemployed; 1 = employed; Any depression in first degree relative: 0 = no; 1 = yes; Current cannabis use: 0 = no; 1 = yes; Current anti-psychotic use: 0 = no; 1 = yes.
Duration of untreated psychosis (DUP): date of first contact minus onset date in weeks.
CAPE: Community Assessment of Psychotic Experiences; CAPE subscale positive symptom sum score: CAPE items 2-5-6-7-10-11-13-15-17-20-22-24-26-28-30-31-33-34- 41-42 (20 items). CAPE subscale negative symptom sum score: CAPE items 3-4-8-16-18-21-23-25-27-29-32-35-36-37 (14 items). CAPE subscale depressive symptom sum score: CAPE items 1-9-12-19-38-39-40 (7 items; item 14 excluded).
χ^2: Wald statistic; df: degrees of freedom; *p*: *p*-value: $^{**}p < 0.01$; $^{*}p < 0.05$; OR: odds ratio; CI: confidence intervals.

6.31, $p = 0.01$) remained associated with suicidal ideation in control individuals over and above other sociodemographic and clinical factors, or social and academic functioning in childhood. The parameter estimates of the univariate and multivariate model are shown in Table 3. The multivariate binary logistic regression model demonstrated good fit based upon the non-significant Hosmer and Lemeshow test ($\chi 2$ (8) = 12.44, $p = 0.13$). When correlates were added to the null model (block 1), the model was significant: χ^2 (9) = 244.42, $p < 0.001$, pseudo-R^2 = 0.37 (Nagelkerke).

4. Discussion

This cross-sectional study, part of the multicentre EUGEI study, investigated whether lifetime, self-reported suicidal ideation was associated with sociodemographic characteristics, clinical symptoms, social and academic functioning and/or presence of childhood trauma in individuals with FEP and healthy controls. We found that 53.5 % of individuals with FEP and 23.8 % of control individuals reported to have experienced any lifetime suicidal ideation. In individuals with FEP, positive, negative and depressive symptoms as well as traumatic childhood experiences were associated with suicidal ideation. However,

Table 3
Correlates unique contributions in the binary logistic regression analyses.
DV = SI measured with cape item 14a.

Controls (n = 857)	Univariate					Multivariate				
	χ^2	df	*p*	OR	CI	χ^2	df	*p*	OR	CI
Age at assessment	0.00	1	0.99		0.99–1.01					
Gender (1)	13.07	1	0.00**	1.82	1.32–2.52	2.69	1	0.10	1.39	0.94–2.04
Ethnicity (1)	0.00	1	0.98	1.01	0.69–1.46					
Migrant (1)	0.40	1	0.53	0.86	0.55–1.36					
Long-term relationship (1)	0.84	1	0.36	0.77	0.43–1.36					
Education level (2)	6.40	2	0.01*	2.32	1.21–4.44	1.63	1	0.20	1.71	0.75–3.88
Main social class (1)	0.03	1	0.86	1.23	0.14–11.04					
Any depression in 1st degree relatives (1)	9.32	1	0.00**	1.67	1.20–2.32	1.34	1	0.25	1.27	0.85–1.89
Current cannabis use (1)	0.01	1	0.91	0.97	0.57–1.64					
Current AP use										
Duration of untreated psychosis (DUP)										
Premorbid adjustment scale (PAS) (<12 years old) sum score	11.28	1	0.00**		1.03–1.13	0.05	1	0.82		0.94–1.05
Childhood Trauma Questionnaire (CTQ) total score	46.60	1	0.00**		1.04–1.06	6.31	1	0.01*		1.01–1.04
CAPE positive psychotic symptoms sum score	71.14	1	0.00**		1.15–1.25	4.47	1	0.03*		1.00–1.12
CAPE negative psychotic symptoms sum score	104.01	1	0.00**		1.17–1.27	1.32	1	0.25		0.98–1.09
CAPE depressive symptom sum score	145.21	1	0.00**		1.49–1.73	54.33	1	0.00**		1.31–1.60

Legend: Gender: 1 = male; 2 = female; Ethnicity: 1 = white; 2 = non-white; Migrant: 0 = no; 1 = yes; Long-term relationship: 0 = no; 1 = yes; Educational level: 0 = higher education; 1 = school, college, vocational; 2 = no qualifications; Main social class: 0 = unemployed; 1 = employed; Any depression in first degree relative: 0 = no; 1 = yes; Current cannabis use: 0 = no; 1 = yes; Duration of untreated psychosis (DUP): date of first contact minus onset date in weeks.
CAPE: Community Assessment of Psychotic Experiences; CAPE subscale positive symptom sum score: CAPE items 2-5-6-7-10-11-13-15-17-20-22-24-26-28-30-31-33-34- 41-42 (20 items). CAPE subscale negative symptom sum score: CAPE items 3-4-8-16-18-21-23-25-27-29-32-35-36-37 (14 items). CAPE subscale depressive symptom sum score: CAPE items 1-9-12-19-38-39-40 (7 items; item 14 excluded).
χ^2: Wald statistic; df: degrees of freedom; *p*: *p*-value: $^{**}p < 0.01$; $^{*}p < 0.05$; OR: odds ratio; CI: confidence intervals.

when subsequently adding all correlates into one model, only depressive symptoms remained associated with suicidal ideation in individuals with FEP. In control individuals, gender, no previous education, positive family history for depression, positive, negative and depressive symptoms, traumatic childhood experiences, and lower social and academic functioning in childhood were associated with suicidal ideation. In the multivariate model, depressive and positive symptoms as well as traumatic childhood experiences contributed to explained variance in control individuals.

Compared to previous studies, we found similarities in reported lifetime prevalence of suicidal ideation both for individuals with FEP (Bakst et al., 2010; Barrett et al., 2010a; Chang et al., 2014; Melle et al., 2010; Nordentoft et al., 2002; Upthegrove et al., 2010), and controls from the general population (Castillejos et al., 2021). The high prevalence of suicidal ideation in individuals with FEP warrants more research into the contributing factors underlying this public health problem.

In line with our results, there is mounting evidence that the co-occurrence of depressive symptoms and hopelessness is associated with suicidal ideation in individuals with FEP (Bakst et al., 2010; Barrett et al., 2015; Bertelsen et al., 2007; Bornheimer, 2019; Bornheimer et al., 2021; Chang et al., 2014; Madsen and Nordentoft, 2012; Nordentoft et al., 2002; Salagre et al., 2021; Sanchez-Gistau et al., 2015), and in the general population (Carrasco-Barrios et al., 2020). Moreover, Bornheimer et al. reported that the likelihood of experiencing suicidal ideation was increased when positive and depressive symptoms were present concomitantly (Bornheimer, 2019; Bornheimer et al., 2021). Results from the control group support this finding, given that the experience of subclinical positive symptoms contributed to the multivariate model. Although this was in contrast to the FEP group, where a contribution of positive symptoms was only found in the univariate model. When depressive symptoms were added to the model, the contribution of positive symptoms was no longer significant. Previous studies have inconsistently shown that positive symptoms, especially hallucinations and delusions, are associated with suicidal ideation and may increase the subsequent risk for engaging in suicidal behaviours in individuals with FEP (Bornheimer, 2019; Bornheimer et al., 2021; Bornheimer and Jaccard, 2017; Grover et al., 2022). However, numerous studies did not find an association between hallucinations and/or delusions with suicidal ideation and/or behaviour in individuals with FEP (Bertelsen et al., 2007; Challis et al., 2013; Chang et al., 2014; Nordentoft et al., 2002; Pompili et al., 2011b) or schizophrenia (van Heeringen, 2012). It could be that in our study the association between positive symptoms and suicidal ideation in individuals with FEP was no longer significant in the multivariate model due to the high co-occurrence between positive and depressive symptoms, which is supported by their relative high correlation ($r = 0.54^{**}$).

In accordance with our results, previous cross-sectional and prospective studies among the general population have linked psychotic experiences (PEs) to an increased risk for suicidal ideation, and especially suicidal behaviour and suicide attempts (Bromet et al., 2017; DeVylder et al., 2015; Honings et al., 2016a; Honings et al., 2016b; Kelleher et al., 2012, 2013; Nishida et al., 2010; Saha et al., 2011; Yates et al., 2019). Co-occurring psychopathology is suggested to only be a partial mediator of the association between PEs and suicidal behaviour in the general population (Yates et al., 2019). Other factors that may contribute to suicidal ideation and behaviour are insight (such as awareness of mental illness), and stigma (Ventriglio et al., 2016). Also, duration of untreated psychosis (DUP) has previously been associated with suicidal ideation and behaviour among individuals with psychosis, possibly due to their poorer outcome of illness (Melle et al., 2006; Ventriglio et al., 2016), although this is in contrast with our findings in the FEP group.

Furthermore, the association between negative symptoms and suicidal ideation is not well established in individuals with FEP (Grover et al., 2022) or in the general population (Dominguez et al., 2010; Werbeloff et al., 2015). Studies conducted in individuals with psychotic disorders speculated that negative symptoms protect against suicidal ideation and behaviour (Chang et al., 2014; Fenton et al., 1997; Gomez-Duran et al., 2014; Grover et al., 2022; Hor and Taylor, 2010; Huang et al., 2018; Kjelby et al., 2015; Seeman, 2017; Tarrier et al., 2007; Ventriglio et al., 2016). Yet, the study of Gill et al., found that negative symptoms remained positively correlated with severity and intensity of recent suicidal ideation, even if adjusted for depression scores among individuals at clinical high risk for psychosis (Gill et al., 2015). Partially in line, our results from the FEP group showed that negative symptoms contributed to the univariate model, however, when depressive symptoms were added this contribution diminished. In general, there remains uncertainty around assessing depression and delineating depressive from negative symptoms. Further, it remains controversial whether depressive symptoms are part of an affective component of the psychotic episode, highlighting the need for a better understanding of the diagnostic uncertainty and course of mood symptoms in early psychosis (Bashir et al., 2022; Sanchez-Gistau et al., 2015; Upthegrove et al., 2017; Vargas et al., 2019). Especially since recent studies suggested that depressive symptoms are more prevalent in the early phases of illness compared to later stages, and could influence the course of negative symptoms in early psychosis (Vargas et al., 2019).

Moreover, a possible association between traumatic experiences in childhood, depression and suicidal ideation and behaviour has been observed before in individuals with FEP (Pelizza et al., 2021; Pompili et al., 2014), and in the general population (Carrasco-Barrios et al., 2020; Devries et al., 2014; Gallagher and Miller, 2018; King and Merchant, 2008; Liu et al., 2017; Miranda-Mendizabal et al., 2019). Consequently, it has been suggested that treatment of early psychosis should consider childhood trauma and possibly comorbid PTSD (Kuipers et al., 2014; Ventriglio et al., 2016). Results from the control group support this idea, since traumatic experiences in childhood contributed to the multivariate model, along with depressive symptoms. Unlike the FEP group, where only a contribution of traumatic experiences in childhood was found in the univariate model.

Last, findings are inconsistent regarding gender, and some studies showed no association between suicidal ideation, behaviour and gender in individuals with FEP, which is in line with our findings, suggesting that the severity of a clinical condition could overrule underlying gender differences (Ventriglio et al., 2016).

4.1. Implications and recommendations

Overall, our findings emphasize the importance of depressive symptoms when screening for suicidal ideation in individuals with FEP. In addition, our findings suggest that clinicians should monitor and treat depressive symptoms in individuals with FEP depending on their severity and persistence.

In the acute phase of psychosis, it is advisable to treat depressive symptoms primarily with antipsychotics because depressive symptoms can improve or disappear with the remission of a psychosis (Van Rooijen et al., 2019), possibly using antipsychotic agents that have a modest beneficial effect on depressive symptoms (such as sulpiride, clozapine, olanzapine, aripiprazole, quetiapine, lurasidone, and amisulpride) (Van Rooijen et al., 2019). If depressive symptoms persist beyond the acute phase, or occur after the psychotic episode went into remission, selective serotonin re-uptake inhibitors (SSRIs) could be used in addition to antipsychotic medication (Van Rooijen et al., 2019). In general, physical activity is highly recommended when patients suffer from depressive symptoms given its beneficial effects on symptom severity and the lack of adverse effects (Van Rooijen et al., 2019), next to psycho-education and family support. Currently, less is known of the effect of cognitive behavioural therapy (CBT) in the early phase of psychosis (Sönmez et al., 2020), and there is no clear evidence for favouring CBT over other therapies for individuals with psychosis (Jones et al., 2018). Although studies reported that CBT could be effective in targeting negative

symptoms, findings have been heterogenous, and a recent umbrella review found no convincing evidence for the effectiveness of CBT for negative symptoms in schizophrenia spectrum disorders (Berendsen et al., 2024; Jones et al., 2018; Sönmez et al., 2020).

In addition, our findings underscore the importance of depressive symptoms, subclinical positive psychotic symptoms (PEs), and traumatic childhood experiences when screening for suicidal ideation in individuals without a psychiatric history. We propose that these individuals should be closely monitored, especially after mental health service use, since these individuals could be at increased risk for suicidal ideation, behaviour, and/or transition toward a psychotic or bipolar disorder (Bolhuis et al., 2021, 2024; Paquin et al., 2023). Moreover, suicidal behaviours may present before the onset of overt psychosis symptoms, which suggests that this could be an important high-risk group for intervening to prevent the possible onset of future psychotic disorders (Bolhuis et al., 2021, 2024). Future, longitudinal research should investigate the course and interdependence of suicidal ideation, depressive, and (subclinical) positive symptoms in individuals with FEP and control individuals from the general population.

4.2. Strengths and limitations

This study must be considered in the light of the following strengths and limitations. The current study has a large sample size, multicentre study design and included a large variety of sociodemographic, clinical, and childhood trauma measurements, as well as social and academic functioning in childhood. A strength is the inclusion of incident FEP subjects. However, our study has a cross-sectional design and is consequently limited in its interpretation for causality. We do recommend for future studies to use a longitudinal design when feasible (Bolhuis et al., 2021).

Also, the age of the study population was relatively old for individuals with FEP, with a median age of 32.4 years for cases and 38.2 years for controls which could limit the generalizability of our findings. Further we found significant differences between the group of cases with data versus without data on suicidal ideation, for the following the variables: ethnicity, migrant status, employment status, current cannabis usage, DUP, and the CTQ total score. This could represent a form of selective missingness, which could have led to selection bias by not including the entire spectrum of individuals with FEP, specifically the more severe spectrum, and this could have influenced our found associations. However, simulation studies have shown that associative regression analyses are only marginally affected by selective drop-out (Wolke et al., 2009).

Unfortunately, no data were available for history of suicide attempt, completed suicide or awareness of illness (insight). Moreover, assessment of suicidal ideation was done using a single item from a lifetime self-reported questionnaire for cases and controls. Although assessing suicidal ideation with an item from a depression section is in line with previous studies (Barrett et al., 2015; Grover et al., 2022; Honings et al., 2016b), it would be beneficial for future research to assess suicidal ideation by using questionnaires primarily designed for this purpose, such as the Columbia suicide severity rating scale (C-SSRS) (Posner et al., 2011). In addition, the current study used mostly self-reported questionnaires (CAPE and CTQ), which could increase the chance of same-rater bias and common method variance bias. Last, although we included a large sample size, we still have considerable missing data due to complete case regression analyses and the inclusion of a sample with data availability for all correlates. However, imputation was considered less appropriate since most variables had >20 % of missing data.

4.3. Conclusion

Suicidal ideation is prevalent in individuals with FEP and healthy controls, and more research into the contributing factors underlying this global public health problem is warranted. This study showed that depressive symptoms contributed to suicidal ideation in individuals with FEP, underscoring their relevance for suicidal risk stratification endeavours. In addition, we found discrepancies between individuals with FEP and healthy controls in variables contributing to suicidal ideation. Our findings emphasize the importance of depressive symptoms when screening for suicidal ideation in individuals with FEP. Moreover, we recommend to monitor and treat depressive symptoms in individuals with FEP, depending on their severity and persistence.

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Data resource access

The EU-GEI WP2 principal investigators (PIs) (contact: craig.morgan@kcl.ac.uk) welcome formal requests for access to the data, biological samples, and/or collaborative projects. Researchers will be required to complete an EU-GEI WP2 data interest form to state their intended hypotheses and analysis plan, which will be reviewed by the PIs to determine whether the proposal can be addressed by this data resource, does not duplicate ongoing or completed analyses with this dataset, and lies within the scope of current ethical approvals. More information about the study can be found on the study website (https://www.eu-gei.eu/).

CRediT authorship contribution statement

C.B.B.C.M. Heuschen: Conceptualization, Methodology, Formal analysis, Software, Data curation, Visualization, Writing - original draft, Writing - review and editing. **K. Bolhuis:** Conceptualization, Methodology, Supervision, Writing – review & editing. **J.B. Zantvoord:** Methodology, Supervision, Writing – review & editing. **C.L. Bockting:** Supervision, Writing – review & editing. **D.A.J.P. Denys:** Supervision, Writing – review & editing. **A. Lok:** Supervision, Writing – review & editing. **C. Arango:** Data curation, Writing – review & editing. **M. Arrojo:** Data curation, Writing – review & editing. **M. Bernardo:** Data curation, Writing – review & editing. **J. Bobes:** Data curation, Writing – review & editing. **C.M. Del-Ben:** Data curation, Writing – review & editing. **M. Di Forti:** Data curation, Writing – review & editing. **C. Gayer-Anderson:** Data curation, Writing – review & editing. **P.B. Jones:** Data curation, Writing – review & editing. **H.E. Jongsma:** Data curation, Writing – review & editing. **J.B. Kirkbride:** Data curation, Writing – review & editing. **C. La Cascia:** Data curation, Writing – review & editing. **A. Lasalvia:** Data curation, Writing – review & editing. **S. Tosato:** Data curation, Writing – review & editing. **P.M. Llorca:** Data curation, Writing – review & editing. **P.R. Menezes:** Data curation, Writing – review & editing. **R.M. Murray:** Data curation, Writing – review & editing. **D. Quattrone:** Data curation, Writing – review & editing. **B.P. Rutten:** Data curation, Writing – review & editing. **J. Sanjuán:** Data curation, Writing – review & editing. **J.P. Selten:** Data curation, Writing – review & editing. **A. Szöke:** Data curation, Writing – review & editing. **I. Tarricone:** Data curation, Writing – review & editing. **A. Tortelli:** Data curation, Writing – review & editing. **E. Velthorst:** Data curation, Writing – review & editing. **L. de Haan:** Conceptualization, Data curation, Methodology, Supervision, Writing – review & editing. **F. Schirmbeck:** Conceptualization, Methodology, Supervision, Writing – review & editing.

Declaration of competing interest

A. Lok is a member of the suicide advisory board of Jansen. C. Arango has been a consultant to or has received honoraria or grants from Acadia, Angelini, Biogen, Boehringer, Gedeon Richter, Janssen Cilag, Lundbeck, Medscape, Menarini, Minerva, Otsuka, Pfizer, Roche, Sage, Servier, Shire, Schering Plough, Sumitomo Dainippon Pharma, Sunovion and Takeda. M. Bernardo has been a consultant for, received grant/research support and honoraria from, and been on the speakers/advisory board of ABBiotics, Adamed, Angelini, Casen Recordati, Janssen-Cilag, Menarini, Rovi and Takeda. M. Di Forte has received honoraria for educational lectures from Recordati, Janssen and Lumbech. PM. Llorca has been a consultant for, received grant/research support and honoraria from, and been on the speakers/advisory board of Boehringer-Ingelheim, Eisai, Ethypharm, Janssen-Cilag, Lundbeck, Neuraxpharm, Otsuka, Rovi.

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