**Supplementary Materials**

**S1 Figure.** Screening procedure for general academic and mathematics achievement in youth aged 16 years or younger who later developed schizophrenia or a schizophrenia spectrum disorder

**S2 Figure.** Screening procedure for educational level attained among individuals with an adulthood diagnosis of schizophrenia or a schizophrenia spectrum disorder

**S3 Table.** Description of stages in educational systems for countries included in the meta-analysis of educational level attained

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**S6 Table.** Quality assessment of studies using the Newcastle-Ottawa Scale for case-control studies

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## S1 Figure. Screening procedure for general academic and mathematics achievement in youth aged 16 years or younger who later developed schizophrenia or a schizophrenia spectrum disorder

## Identification

## Eligibility

## Included

## Screening

Additional records identified through other sources
(n = 5)

Records identified through database searching 2011-2019
(n = 3823)

Records after duplicates removed
(n = 2751)

Records screened
(n = 2751)

Full-text articles assessed for eligibility
(n = 27)

Records excluded after title and abstract screening
(n = 2724)

Full-text articles excluded, with reasons
(n = 21):

- Overlapping sample (n = 3)

- No comparison group (n = 3)

- Subject group at-risk for psychosis (n = 1)

- Use of academic premorbid adjustment scale (n = 3)

- Self-reported academic grades (n = 1)

- Report of educational level achievement (n = 7)

- No measure of academic achievement (n = 3)

Studies added to the updated quantitative synthesis (meta-analysis)
(n = 6)

## S2 Figure. Screening procedure for educational level attained among individuals with an adulthood diagnosis of schizophrenia or a schizophrenia spectrum disorder

## Identification

## Eligibility

## Included

## Screening

Additional records identified through other sources
(n =26)

Records identified through database searching
(n =14 541)

Records after duplicates removed
(n =13 088)

Records screened
(n = 13 088)

Full-text articles assessed for eligibility
(n = 472)

Records excluded after title and abstract screening
(n = 12 616)

Full-text articles excluded, with reasons (n = 450):

- Insufficient data reported for education level (n = 276)

- No comparison group (n = 97)

- No report of education (n = 43)

- Subject group not specific to schizophrenia or SSD (n = 10)

- Education-matched control groups (n = 18)

- Overlapping samples (n = 3)

- Unable to access (n = 2)

- Author could not provide data to calculate effect size (n = 1)

Studies included in quantitative synthesis (meta-analysis)
(n = 22)

## S3 Table. Description of stages in educational systems for countries included in the meta-analysis of educational level attained

|  |  |  |  |
| --- | --- | --- | --- |
| Country of Origin | Study | Stages in Educational Systemsa (age in years) | School leaving age |
| Bulgaria | Veleva et al. (2019) | Primary school (7-10) | Presecondary school (11-14) | Secondary education (15-19) | Tertiary | 16 |
| Denmark | Greve et al. (2017) | Primary and lowersecondary (7-16) | Upper secondary/Vocational (16-18) | Tertiary |  | 16 |
| Finland | Isohanni et al. (2001) | Primary and lowersecondary (7-16) | Upper secondary(16-19) | Tertiary |  | 16 |
| France | Breton et al. (2011) | Primary school (6-11) | Collèges (11-15) | Lycées (15-18) | Tertiary | 16 |
| Greece | Fountoulakis et al. (2018) | Primary school (6-12) | Junior High School(12-15) | General High School (15-18) or Vocational (15-17) | Tertiary | 15 |
| India | Rathor et al. (2008) | Primary (6-14) | Secondary (14-18) | Tertiary |  | 14 |
| Jamaica | Burgess et al. (2013) | Primary school (6-11) | Secondary (12-17) | Post-secondary (17-19) | Tertiary | b |
| Netherlands | Meesters et al. (2013) | Primary school (4-12) | Secondary junior(12-16) or senior(12-17/18) | Vocational (16-20) or Tertiary (17/18-21) |  | 18 |
| Vreeker et al. (2016) | 18 |
| Tempelaar et al. (2017) | 18 |
| Poland | Stramecki et al. (2018) | Primary and lower secondary (7-16) | Upper secondary (16-18)/Vocational (16-19) | Tertiary |  | 16c |
| Qatar | Bener et al. (2014) | Elementary (6-12) | Prepatory (13-15) | Secondary (16-18) | Tertiary | b |
| South Korea | Kim et al. (2019) | Primary school (7-12) | Middle school (13-15) | Academic or vocational high school (16-18) | Tertiary | 15 |
| Country of Origin | Study | Stages in Educational Systemsa (age in years) | School leaving age |
| Spain | Gurpegui et al. (2005) | Primary school (6-12) | Secondary [ESO](12-16) | Higher secondary [Bachillerato/Ciclos Formativos de Grado Medio] (16-18) | Tertiary | 16 |
| Garcia-Laredo et al.(2015) | 16 |
| Turkey | Akal and Dogan (2010) | Primary (6-14) | Secondary (14-17) | Tertiary |  | 18 |
| UK | Mallett et al. (2004) | Primary (6-11) | Lower secondary (12-16) | Upper secondary (16-18) | Tertiary | 16 |
| US | Johnson-Greene et al. (1997) | Elementary school[Kindergarten &Grade 1-5] (5-10) | Middle school[Grade 6-8](11-13) | High school [Grade 9-12](14-18) | College & Graduateschool | d |
| Cohen et al. (2002) | d |
| Duarte et al. (2008) | 16-18d |
| Diaz et al. (2008) | 18 |
| Nugent et al. (2015) | 18 |

aDue to significant differences in the educational systems of countries, this information must be interpreted horizontally as columns do not reflect equivalent stages of educational systems. Excludes preschool or nursery school.

bSchool leaving age could not be determined

cAge 15 years in new structure implemented in 2017

dSample included individuals from a variety of US states where school leaving age differs

## S4 Figure. Screening procedure for general academic achievement among children presenting with psychotic-like experiences

## Identification

## Eligibility

## Included

## Screening

Additional records identified through other sources
(n = 2)

Records identified through database searching
(n = 585)

Full-text articles assessed for eligibility
(n = 7)

Records screened
(n = 414)

Records after duplicates removed
(n = 414)

Records excluded after title and abstract screening
(n = 407)

Full-text articles excluded, with reasons
(n = 4):

- Used literacy scores as measure of general academic achievement (n = 1)

- Used reading ability scores as measure of general academic achievement (n =1)

- Teacher-reported measure of general academic achievement (n = 1)

- Author did not respond when contacted (n=1)

Studies included in quantitative synthesis (meta-analysis)
(n = 3)

## S5 Figure. Screening procedure for general academic achievement among children with a family history of schizophrenia or a schizophrenia spectrum disorder

## Identification

## Eligibility

## Included

## Screening

Additional records identified through other sources
(n = 1)

Records identified through database searching
(n = 1778)

Full-text articles assessed for eligibility
(n = 19)

Records screened
(n = 1403)

Records after duplicates removed
(n = 1403)

Records excluded after title and abstract screening
(n = 1384)

Full-text articles excluded, with reasons
(n = 15):

- Self-reported academic grades (n = 1)

- No objective measure of academic achievement in youth aged 16 years or younger (n = 7)

- Used reading ability scores as measure of general academic achievement (n = 1)

- Use of academic premorbid adjustment scales (n = 4)

- Different measure of academic achievement (n = 1)

- Author unable to provide data to calculate effect size (n = 1)

Studies included in quantitative synthesis (meta-analysis)
(n = 4)

## S6 Table. Quality assessment of studies using the Newcastle-Ottawa Scale for case-control studies

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Authors | Selection (☆☆☆☆) | Comparabilitye | Exposure (☆☆☆) | Overall number of stars (0-9) |
| (☆☆) |
| Q1a | Q2b | Q3c | Q4d |   | Q1f | Q2g | Q3h |   |
| **General academic achievement (update)** |
| Isohanni et al. (1998) | ☆ | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ | ☆ | 9 |
| Cannon et al. (1999) |  | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ |  | 7 |
| Ang and Tan (2004)  | ☆ | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ | ☆ | 9 |
| Bilder et al. (2006) | ☆ | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ |  | 8 |
| MacCabe et al. (2008) |  | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ |  | 7 |
| Chong et al. (2009) |  | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ |  | 6 |
| Seidman et al. (2013) | ☆ | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ |  | 8 |
| Schulz et al. (2014) | ☆ | ☆ | ☆ |  | ☆ | ☆ | ☆ |  | 6 |
| Lin et al. (2017) |  | ☆ | ☆ |  | ☆☆ | ☆ | ☆ |  | 6 |
| Ullman et al. (2017) |  | ☆ | ☆ |  | ☆☆ | ☆ | ☆ |  | 6 |
| Sørensen et al. (2018) |  | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ |  | 7 |
| **Mathematics achievement (update)** |
| Jones et al. (1994) | ☆ | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ |  | 8 |
| Crow et al. (1995) | ☆ | ☆ | ☆ | ☆ |  | ☆ | ☆ |  | 6 |
| Helling et al. (2003) | ☆ | ☆ | ☆ |  | ☆☆ | ☆ | ☆ |  | 7 |
| Ang and Tan (2004)  | ☆ | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ | ☆ | 9 |
| Lin et al. (2017) |  | ☆ | ☆ |  | ☆☆ | ☆ | ☆ |  | 6 |
| Ullman et al. (2017) |  | ☆ | ☆ |  | ☆☆ | ☆ | ☆ |  | 6 |
| Sørensen et al. (2018) |  | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ |  | 7 |
| S6 Table. Continued |  |  |  |  |  |  |  |  |  |
| Authors | Selection (☆☆☆☆) | Comparabilitye | Exposure (☆☆☆) | Overall number of stars (0-9) |
| (☆☆) |
| Q1a | Q2b | Q3c | Q4d |   | Q1f | Q2g | Q3h |   |
| **Educational level attained** |
| Johnson-Greene et al. (1997) | ☆ |  | ☆ |  |  | ☆ | ☆ |  | 4 |
| Isohanni et al. (2001) | ☆ | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ | ☆ | 9 |
| Cohen et al. (2002) |  |  | ☆ | ☆ | ☆☆ |  | ☆ |  | 5 |
| Mallett et al. (2004) | ☆ | ☆ | ☆ | ☆ | ☆☆ |  | ☆ |  | 7 |
| Gurpegui et al. (2005) | ☆ | ☆ |  | ☆ | ☆ |  |  | ☆ | 5 |
| Duarte et al. (2008) | ☆ |  | ☆ |  |  |  | ☆ | ☆ | 4 |
| Diaz et al. (2008) | ☆ | ☆ | ☆ |  | ☆☆ |  |  | ☆ | 6 |
| Rathor et al. (2008) | ☆ | ☆ |  | ☆ |  |  |  |  | 3 |
| Akal and Dogan (2010) | ☆ | ☆ | ☆ | ☆ | ☆☆ |  | ☆ |  | 7 |
| Breton et al. (2011) | ☆ | ☆ | ☆ | ☆ | ☆☆ |  |  | ☆ | 7 |
| Meesters et al. (2013) | ☆ |  | ☆ | ☆ | ☆☆ |  | ☆ | ☆ | 7 |
| Burgess et al. (2013) | ☆ | ☆ |  |  | ☆ |  |  |  | 3 |
| Bener et al. (2014) | ☆ | ☆ | ☆ | ☆ | ☆☆ |  | ☆ | ☆ | 8 |
| Garcia-Laredo et al. (2015) | ☆ | ☆ |  | ☆ | ☆ |  |  | ☆ | 5 |
| Nugent et al. (2015) | ☆ | ☆ | ☆ | ☆ | ☆☆ |  |  | ☆ | 7 |
| Vreeker et al. (2016) | ☆ | ☆ | ☆ | ☆ | ☆☆ |  | ☆ |  | 7 |
| Tempelaar et al. (2017) |  | ☆ | ☆ |  | ☆☆ | ☆ | ☆ |  | 6 |
| Greve et al. (2017) |  | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ |  | 7 |
| Fountoulakis et al. (2018) | ☆ | ☆ | ☆ | ☆ | ☆☆ |  |  | ☆ | 7 |
| Stramecki et al. (2018) | ☆ | ☆ | ☆ | ☆ | ☆☆ |   |   | ☆ | 7 |
|  |  |  |  |  |  |  |  |  |  |
| S6 Table. Continued |  |  |  |  |  |  |  |  |  |
| Authors | Selection (☆☆☆☆) | Comparabilitye(☆☆) | Exposure (☆☆☆) | Overall number of stars (0-9) |
|  | Q1a | Q2b | Q3c | Q4d |  | Q1f | Q2g | Q3h |  |
| Kim et al. (2019) |  | ☆ |  |  | ☆☆ |  | ☆ |  | 4 |
| Veleva et al. (2019) |  |  |  |  | ☆☆ |  | ☆ | ☆ | 4 |
| aIs the case definition adequate?; bRepresentativeness of the cases; cSelection of Controls; dDefinition of Controls; eComparability of Cases and Controls on the Basis of the Design or Analysis; fAscertainment of Exposure; gSame Method of Ascertainment for Cases and Controls; hNon-Response rate  |

S7 Table. Quality assessment of studies using the Newcastle-Ottawa Scale for cohort studies

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Authors | Selection (☆☆☆☆) | Comparabilitye | Outcome (☆☆☆) | Overall number of stars (0-9) |
| (☆☆) |
| Q1a | Q2b | Q3c | Q4d |   | Q1f | Q2g | Q3h |   |
| **Psychotic-like Experiences** |
| Bartels-Velthuis et al. (2011) | ☆ | ☆ | ☆ | ☆ | ☆☆ |  | ☆ |  | 7 |
| Dickson et al. (2014) | ☆ | ☆ |  | ☆ | ☆☆ | ☆ | ☆ | ☆ | 8 |
| Wu et al. (2014) | ☆ | ☆ |  | ☆ | ☆ | ☆ | ☆ | ☆ | 7 |
| **Family History of Schizophrenia**  |
| Jundong et al. (2012) | ☆ | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ |  | 8 |
| Forsyth et al. (2013) | ☆ | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ |  | 8 |
| Dickson et al. (2014) |  | ☆ |  | ☆ | ☆☆ | ☆ | ☆ | ☆ | 7 |
| Lin et al. (2017) | ☆ | ☆ | ☆ | ☆ | ☆☆ | ☆ | ☆ |   | 8 |
| aRepresentativeness of the Exposed Cohort; bSelection of the Non-Exposed Cohort; cAscertainment of Exposure; dDemonstration that Outcome of Interest was not Present at Start of the Study; eComparability of Cohorts on the Basis of the Design or Analysis; fAssessment of Outcome; gWas Follow-Up Length enough for Outcomes to occur; hAdequacy of Follow-Up of Cohorts  |