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The association between neighborhood characteristics and adolescent psychotic experiences

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Abstract

Psychotic experiences (PEs) occur in up to 30% of children, usually subsiding during adolescence. The presence of PEs alone can lead to mental distress; additionally its persistence can have grave consequences for the child's development. Neighborhood characteristics are a promising new frontier for research on the development of PEs in childhood and adolescence. The main aim of this study was to investigate the relationship between neighborhood social cohesion, living conditions, objective and perceived safety, and PEs at age 14. The secondary aim was to investigate the relationship of the aforementioned neighborhood factors with the trajectory of PEs from age 10 to 14. We ran a specificity analysis using depressive symptoms to evaluate whether the associations were indicative of a link with general psychopathology or specific psychotic spectrum outcomes. We used the Generation R cohort data on self-reported hallucinations and delusions, and the Wijkprofiel Rotterdam on social, safety, and physical characteristics of the neighborhood. In our multilevel logistic regression analysis, we found no evidence for an association of any neighborhood factors with PEs at age 14. There were trends demonstrating the potential association between living conditions and two outcomes: remission of PEs at age 14, and severe depressive symptoms. However, neither association survived multiple testing correction. We discuss the need for further research to ascertain whether the associations apply to general psychopathology or psychotic spectrum outcomes. Furthermore, we propose the need to clarify new potential associations of neighborhood factors with PEs.

Keywords: Psychotic experiences, neighborhood characteristics, adolescence

Introduction

Psychotic experiences or psychotic-like experiences (PEs) are subclinical psychotic symptoms such as delusions and hallucinations which occur without meeting criteria for a psychotic disorder diagnosis (Healy & Cannon, 2020). PEs are at the beginning of the psychosis continuum, which represents a variety of durations and severity of symptoms, culminating in the diagnosis of psychotic disorders (van Os & Reininghaus, 2016). Up to 30% of children experience PEs, with lower prevalence for adolescents (Kelleher et al., 2012; Newbury et al., 2016). Although PEs may develop further into a psychotic episode, for a parcel of the population they are thought to be a normal transitory state. Research shows 80% of PEs subside while 20% persist, with 7% converting to a lifetime psychotic disorder (van Os & Reininghaus, 2016). In general, the presence of PEs accompanies mental distress and general psychopathology (Bolhuis et al., 2018; Jeppesen et al., 2015; Kelleher, Keeley, et al., 2012). In the persistent case, childhood PEs may predict worse development and outcomes, leading to adulthood psychotic disorders, substance abuse disorder, depression and suicide (Newbury et al., 2017). This highlights the importance of PEs as a complex transdiagnostic marker in children and adolescents.

Research on PEs is relatively novel, but much of the knowledge on general psychosis is confirmed for PE as well: there seem to be hereditary predispositions, traumatic triggers and environmental influences (Bolhuis et al., 2018; Havers et al., 2019; Zavos et al., 2014), which act in an additive manner (Cougnard et al., 2007). However, single occurrence PEs, especially hallucinations, have lower heritability and higher non-shared environment contributions than schizophrenia (Zavos et al., 2014). There is also evidence that there is a role of the environment in the maintenance and persistence of PEs (Cougnard et al., 2007; Havers et al., 2019). Thus, environmental influences are key to the development and persistence of PEs.

A frequently investigated environmental factor in relation to the psychotic spectrum is urbanicity. Specifically, there is initial evidence that PEs in children may be connected to birth (Lundberg et al., 2009; Solmi et al., 2020) and upbringing (Coid et al., 2018; Cougnard et al., 2007; Spauwen et al., 2006) in an urban setting. Urbanicity in general is associated to psychotic symptoms, even when controlling for familial or genetic risk (Solmi et al., 2020; van Os et al., 2002). Researchers suggest that the relationship between urbanicity and PEs may be explained by interactions of the individual with the environment, where variables such as social isolation, social defeat, fragmentation, and discrimination could play a role (Mizrahi, 2016; Radua et al., 2018; van Os et al., 2010; Veling et al., 2016). Recently, these

potential variables have been integrated into the theoretical framework of the stimulation, discrepancy, and deprivation model, which proposes there are three groups of environmental factors which increase and maintain psychotic experiences (Vargas, Conley, et al., 2020). Stimulation factors contribute to heightened threat and over-stimulation, discrepancy factors are those which address a lack of belonging, and deprivation factors entail a lack of enriching environment (Vargas, Conley, et al., 2020).

From a biological perspective, all of these factors may have a common substrate of social stress, including dopaminergic and cortisonal abnormalities (Mizrahi, 2016; Vargas, Conley, et al., 2020). In a virtual reality experiment, heightened social stress increased paranoia and distress in healthy controls, ultra-high risk and psychotic patients (Veling et al., 2016). Heightening of social stress was achieved by increasing population density, ethnic density and hostility in the virtual environment. This suggests that factors characteristic in urban living can contribute to the development of psychosis spectrum outcomes (van Os et al., 2010).

As such, research focused on neighborhood characteristics represents a promising frontier to explore the urban factors related to childhood and adolescent risk for PEs. Neighborhood social cohesion is an important neighborhood characteristic and represents the closeness of relationship in a community, for example characterized by trust among neighbors, who may share common interests and activities. There is some evidence that social cohesion may be associated with PEs in adolescence (Newbury et al., 2018; Solmi et al., 2017). It is theorized that growing up in a neighborhood where there is unfriendly and/or unpredictable contact with neighboring households can increase social stress perceived by a child, therefore creating a vulnerable environment for the development of PEs (Newbury et al., 2016). Further evidence is necessary for a stronger evaluation of this theory on the role of social cohesion.

Another neighborhood characteristic is living conditions, which may vary according to the type of housing available, the characteristics of the average household and open public spaces. Although there is research concerning the effects of housing properties on children (Bradley, 2015), they concern basic elements related to hygiene and safety, such as disrepair, contaminants, appropriate sanitation, which have consequences to children's' physical health. There are few investigations which elaborate on the effect of living conditions on mental health outcomes. There is evidence that in adulthood living in rented property is related to the development of PEs (Veling et al., 2015). However, it is largely unknown whether living conditions have an impact on the development of PEs in childhood and adolescence.

Furthermore, there is evidence of the association of violence and neighborhood criminality with PEs in both adults and children (Bhavsar et al., 2014; Newbury et al., 2016; Solmi et al., 2017). Up to 50% of the association between urbanicity and PEs in adolescence was explained by threatening and adverse neighborhoods, where neighborhood perceptions may play a role in the development of PEs (Newbury et al., 2017). It is important to note that there may be a difference between perceived safety and objective safety, because perceived safety highlights the role of hostile attributions as a mechanism through which psychotic delusions and paranoia may develop (An et al., 2010). Therefore, it is important to elaborate on the extent of the relationships between objective, perceived safety, and PEs.

The findings for childhood and adolescence PEs are strengthened by the evidence of neighborhood effects on more severe areas of the psychotic spectrum in adulthood (Allardyce et al., 2005; Coid et al., 2020; Hastings et al., 2020; Oher et al., 2014; Veling et al., 2015) where research shows neighborhood during youth and adulthood may be associated with earlier age of first-episode, and worse symptomatology. This would suggest neighborhood factors could have an association across developmental periods and severities in the psychotic spectrum. In sum, there is as of yet limited evidence for the link between neighborhood factors and PEs in childhood and adolescence. Diverse kinds of neighborhood characteristics could be related to PEs, including safety, social, and physical factors of the child's neighborhood of residence. It is unclear whether the association between neighborhood factors and PEs in childhood and adolescence plays a role in the development and/or maintenance of PEs.

We hypothesize that several neighborhood domains may affect the development of PEs during childhood, including social cohesion, living conditions and safety of children's neighborhoods. The goal of this study is therefore to explore whether social cohesion, living conditions, perceived safety and objective safety of neighborhoods are associated with the development of PEs in childhood and adolescence. The main aim is to investigate this prospective relationship between neighborhood-level factors measured at age 9-13 and the occurrence of PEs at age 14. For the main aim we chose to specifically look at adolescent PEs because they are less prevalent than childhood PEs, and generally may be more related to underlying psychopathology (Kelleher, Keeley, et al., 2012). We predict that there is an effect such that the worse the neighborhood scores on the neighborhood factors social cohesion, living conditions, perceived safety and objective safety, the higher the chances of developing PEs.

The secondary aim of this study is to investigate the association of neighborhood-level factors on the trajectory of PEs from age 10 to age 14 years. Measurements were taken at age 10 and age 14 for a longitudinal assessment in hallucinations. Based on previous research showing prolonged environmental influence through formative years may lead to more severe PEs (Coid et al., 2018), and PEs lead to a heightened sensitivity to environmental exposure (Veling et al., 2016), we predict that neighborhood factors may contribute to persistence of PEs. More specifically, we predict that children who live in urban neighborhoods that score worse on the social, residential and safety measures will have a higher likelihood to have PEs, with the strongest associations for a persistent trajectory of PEs.

Method

Participants

Generation R is a prenatal cohort study started in 2002 in the Dutch city of Rotterdam. Pregnant women were recruited from 2002-2006 for the baseline measurement. The pregnant women from Generation R are largely Dutch and highly educated. The complete study protocols and design have been described previously (Jaddoe et al., 2006, 2012). All protocols were approved by the Erasmus Medical Center medical ethics committee, and all data was collected with written informed consent from parents and children.

Data for the Neighborhood-level measure Wijkprofiel (*Wijkprofiel Rotterdam*, 2014) – Neighborhood profile - was collected in 2013. Census data and surveys were used. Approximately 30,000 Rotterdam residents filled in the surveys.

Data from the Generation R cohort was collected in children completing age 10 between the years of 2012-2016, and completing age 14 between the years of 2016-2020. Figure 1 below illustrates the timeline of data collection from all components of this research.

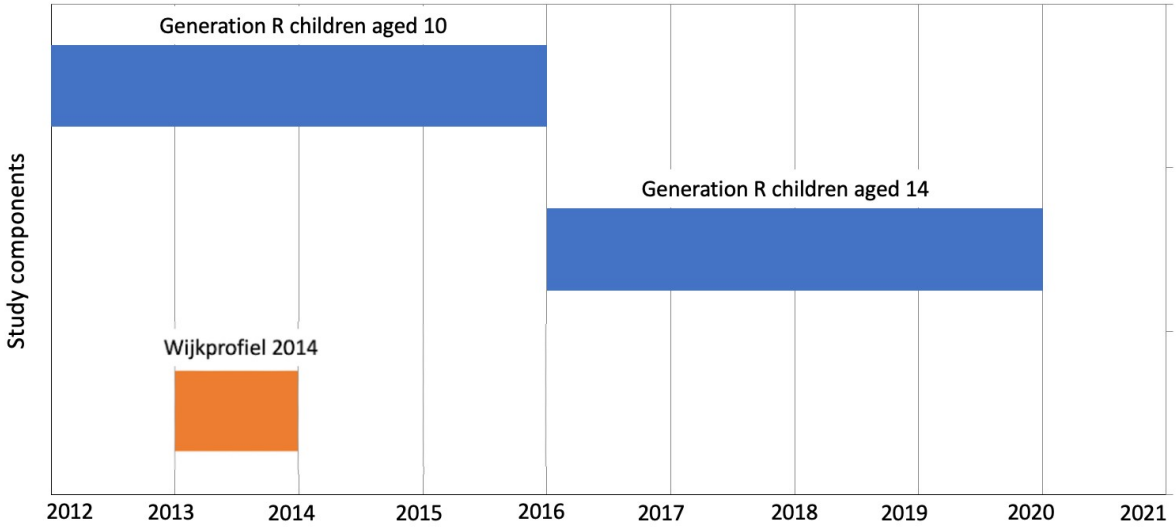

Figure 1: Timeline of data collection in Generation R cohort and Wijkprofiel data

Participants not residing at a Rotterdam address in 2014 at the time of the Wijkprofiel measurement were excluded. To address our main aim, data for psychotic experiences was available for the outcomes hallucinations (N=4499), delusions (N=3659) and PEs overall (N=3523). The description of the data collection samples is given below on Figure 2.

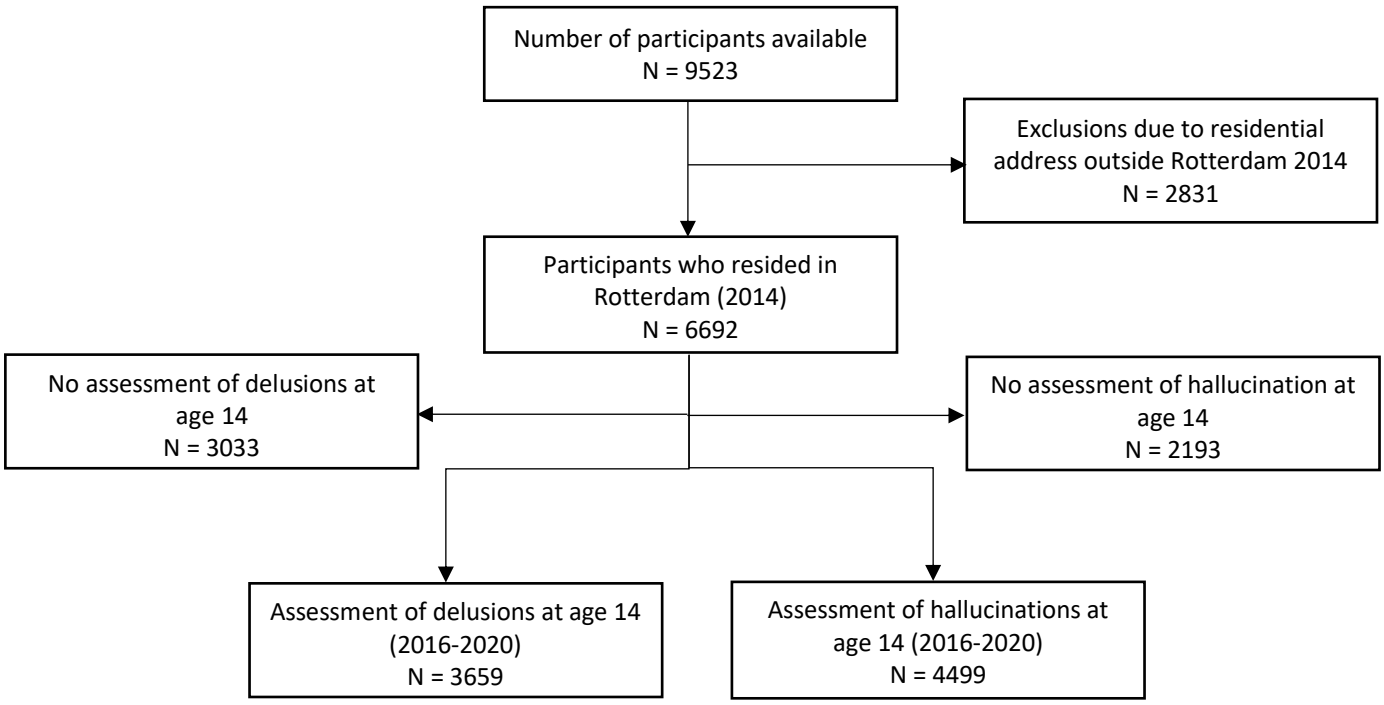

Figure 2: Flowchart of study inclusion main aim

For the secondary analysis, we also excluded children who did not reside in Rotterdam in 2014 at the time of the Wijkprofiel measure. Figure S1 shows the description of this sample. We included all children who had data available for hallucinations at age 10 and 14 (N=3441).

Measures

Neighborhood-level factors

Wijkprofiel Rotterdam. In order to evaluate neighborhood-level characteristics, we chose a municipal-level measurement. The Wijkprofiel Rotterdam (Rotterdam neighborhood profile) is a municipal index, composed by census data and a biannual survey applied on approximately 30,000 residents of the city of Rotterdam (*Wijkprofiel Rotterdam*, 2014). It measured 14 areas and 71 neighborhoods in the Rotterdam municipality. It was created in 2014 and is composed of three indexes: Safety, Social and Physical. Each of the indexes contains multiple domains, which have an objective and a subjective scale. The objective scale reflects census neighborhood statistics or events that happened to the residents, whereas the subjective scale reflects perceptions about the neighborhood. An example of an objective item is "% non-working labor force" while an example of a subjective item is "% of residents that say that local residents spend a lot of time with each other". We selected existing scales from the Wijkprofiel which represent overarching variables found in previous research: objective safety, perceived safety, and living conditions. We assembled a new scale to reflect a previously researched variable: social cohesion.

The objective safety scale is comprised of 20 items of census crime statistics for theft, violence, intrusion, vandalism, and nuisance, for example: "number of thefts of motor vehicles per thousand inhabitants". In comparison, the perceived safety scale was created from questionnaire items addressing resident's perceptions of their neighborhood, ie: "Theft from a car is often a neighborhood problem". Social cohesion represents the closeness of ties within a community. This scale was compiled from Wijkprofiel items to reflect social cohesion scales used in previous research (Solmi et al., 2017), including 12 items such as "% of residents that say that local residents know each other". Living conditions were measured through the subjective housing scale, including 13 items. In this scale, items assessed satisfaction with several properties of the physical space of residence, ie: "% satisfied with house size". Objective measures were not selected for social and living conditions scales because their organization in the Wijkprofiel did not contain a clear underlying construct, making analyses potentially difficult to interpret. The scales and item composition are described in Table S2 and S3.

In order to evaluate the Wijkprofiel scales, we ran a reliability analysis. All of the scales selected showed good reliability: Living conditions (14 items), α= .946, objective safety (20 items), α= .823, perceived safety (34 items), α= .913. The Social Cohesion scale was created from 12 items selected from the subjective social domains and its reliability was also good, α= .905.

Finally, the Wijkprofiel data and the Generation R data were paired via 6-digit postcode. Following the merging procedure, the participant's data postcode information was removed in order to assure anonymization. All data were treated confidentially.

Self-Reported Psychotic Experiences

Self-Reported Hallucinations. The Youth Self Report (YSR) is a self-report instrument for behavioral and emotional problems in childhood and adolescence (Achenbach & Rescorla, 2001). Two items from the YSR were extracted to assess hallucinations at age 10 and 14: (1) *I hear sounds or voices that are not there according to other people* and (2) *I see things that other people think are not there*. Three responses were available: *Not at all* = 0, *A bit* = 1, *Clearly* = 2. The scores were summed and split into three ordinal groups: no symptoms (0 points), minor symptoms (at least 1 point), and moderate-to-severe symptoms (at least 2 points on one of the items). The cut offs were determined so that children in the moderate-to-severe group scored a 2 ("Clearly") on at least one item (Bolhuis et al., 2018; Steenkamp et al., 2020).

Self-Reported Delusions. The Kiddie Schedule for Affective Disorders and Schizophrenia (K-SADS, Kaufman et al., 1997) is a diagnostic tool for the assessment of childhood onset psychiatric disorders. Six items from the K-SADS were extracted to assess self-reported delusions at age 14: (1) *Have other people ever read your thoughts?*, (2) *Have you ever believed that you were being sent special messages through television or radio?*, (3) *Have you ever thought you were being followed or spied on?*, (4) *Have you ever felt as though your body had been changed in some way that you could not understand?*, (5) *Does somebody have the power to control your mind or body (like a robot)?*, and (6) *Have you ever believed you are an important person or have special gifts other people do not have?* Three response options were available: *No* (0)*, Yes, probably* (1), and *Yes, certainly* (2). The scores were summed to be used in an ordinal scale. The children were categorized into three groups similarly to the hallucination measure. The cut offs differed from the hallucination scale due

to availability of more items to be included in the scale. The three groups were: no symptoms (0 points), minor symptoms (score of at least 1 in one item) and moderate-to-severe symptoms (sum score of at least 4, with a score of 2 on at least one item) (Bolhuis et al., 2018; Steenkamp et al., 2020).

Self-Reported Psychotic Experiences. We combined the self-reported hallucinations and delusions. We added the numerical scales together to produce one continuous scale of psychotic experiences ranging from 0 to 14 points. Due to the highly skewed data, we built an ordinal scale. Using this scale, we separated once again the children into three groups: No PEs (score of 0), Mild PEs (score 1-4), and Moderate-to-Severe PEs (score ≥ 5, with at least one item "Yes, certainly").

Self-Reported Depression We used the withdrawn/depressed symptom scale from the YSR to represent a mental pathology other than PEs for a specificity analysis (Achenbach & Rescorla, 2001). The scale includes statements such as: "I would rather be alone than with others". The responses available were the same as the psychosis measure aforementioned, and the items were coded in a similar manner to represent three groups: low depressive symptoms (score 0-3), moderate depressive symptoms (score 3-6), and severe depressive symptoms (score > 6).

Psychotic experiences trajectory

Hallucinations were measured in children at age 10 (T0) and 14 (T1), and delusions only at age 14. Looking at the development of hallucinations over time, the adolescents can belong to one of following categories (where 0 indicates absent, and 1 present): no PEs developed (T0 = 0, T1 = 0), PEs remitted at age 14 (T0 = 1, T1 = 0), PEs incident at age 14 (T0 = 0, T1 = 1), and PEs persistent at age 14 (T0 = 1, T1 = 1). As such, the trajectory of the participants is examined through the four categories: Absent, incident, persistent, and remitted. The presence or absence of hallucinations was determined by the presence of a score above 0 in the hallucinations measure. The categories are described in Figure 3 below.

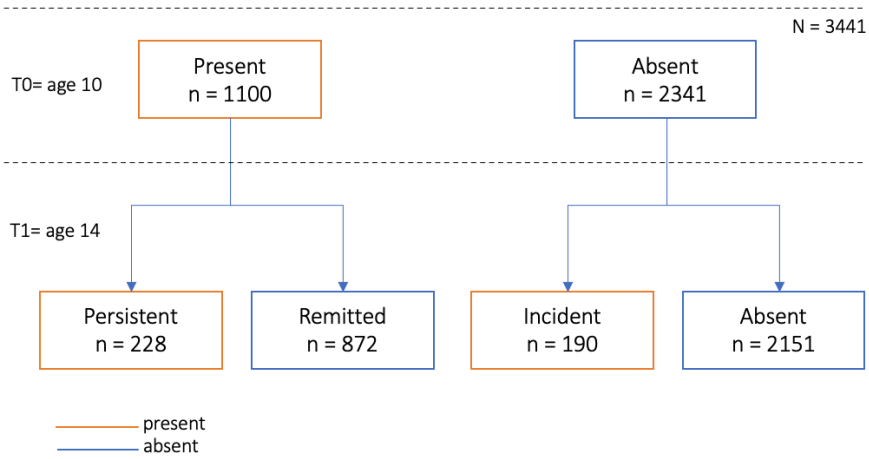

Figure 3: Categories of hallucinations over time at age 10 and 14

Adjustment for covariates

All of the models were controlled for age (continuous) and sex (binary). Since a previous study found that ethnicity was associated with neighborhood variables and psychotic experiences (Coid et al., 2020), we included ethnicity as a covariate. Ethnicity was determined based on maternal origin and contains three categories: Dutch, Non-Dutch Western and Non-Dutch Non-Western.

Furthermore, we included household income, maternal education, and maternal psychotic symptomatology as covariates. There may be a relationship of PEs with income; overall lower household income presents a risk for psychotic symptoms (Solmi et al., 2020). Income was measured as a dichotomous variable, where there were two groups: household income lower than 2300 euros per month, and income higher than 2300 euros per month. Maternal education was measured as an ordinal variable: low (up to primary schooling completed), medium (lower and intermediate vocational training completed), and high education (higher vocational training and university degree completed). Maternal psychotic symptomatology was indicated by two subscales of the Brief Symptoms Inventory (BSI), the Paranoid Ideation and Psychoticism scales. The BSI scales were used without cut-off scores in order to capture potential subclinical manifestations of psychosis. Research has shown that Paranoid Ideation and Psychoticism are related to positive symptoms as measured by the Positive and Negative Symptom Syndrome Scale (PANSS) (Preston & Harrison, 2003). We compiled the scores for Paranoid Ideation and Psychoticism to demonstrate a sensitive multisymptomatic risk for the psychosis spectrum. The two subscales contain 5 items each, and have a summed score ranged 0 – 20.

Statistical analyses

The first aim of this study is to explore the relationship between neighborhood factors and psychotic experiences at age 14 years. There are four predictors of interest: neighborhood social cohesion, objective safety, perceived safety, and living conditions. In order to account for neighborhood clustering, multilevel models were used, using a neighborhood identifier variable. Although the proportional odds assumption was not violated, due to incompatibility between the multiple imputation package mice and ordinal packages in R, the ordinal model was split into two most relevant binary comparisons: Absent-Mild and Absent-Moderate-to-Severe.

Eight multilevel binary logistic regressions were created to evaluate the association of each neighborhood variable with the PE outcome. Additionally, we ran these analyses separately on the outcomes hallucinations at age 14 and delusions at age 14. All statistical analyses were performed using R version 3.5.3 and 4.0.3 (R Core Team, 2020).

With regards to the multilevel model, first, we built a null model including the neighborhood identifier (k=71 neighborhoods) without any predictors to view the variance components and intraclass correlation. In case of a high ICC, the multilevel model would be necessary. Model 1 included the neighborhood variable, with basic individual covariates age and gender. To correct for social-economic factors, the covariates ethnicity, income and maternal education were added in Model 2. Lastly, Model 3 corrected for the effect of maternal psychosis symptomatology. In order to adjust for multiple testing, false discovery correction was applied. In order to deal with missing values in covariates, multiple imputation was used through the package mice (van Buuren & Groothuis-Oudshoorn, 2011).

To evaluate whether the potential associations were specific to PEs or to general psychopathology, a specificity analysis was applied in which the same models were analyzed using depression as an outcome measure.

The secondary purpose of this study is to determine the association between the neighborhood characteristics and the persistence, remittance, or incidence of hallucinations from age 10 to age 14. We ran multilevel pairwise logistic regressions, using Absent as a reference group, compared to Remitted, Incident and Persistent hallucinations at age 14.

Results

Demographics

The characteristics of the study population are shown in Table 1. The adolescents in this sample were approximately half of female sex (53.3%), and the mean age of PEs

assessment was 13 years and 6 months. The adolescents came from predominantly Dutch background, with 68.8% having Dutch mothers, and mothers were highly educated at birth (59% had at least a technical degree). Demographic statistics of the hallucination and delusion samples are very similar, reported in Tables S4 and S5.

At age 14 (N= 4499), 52% of adolescents had no PEs, 44% had mild PEs and 4% had moderate-to-severe PEs. Breaking down the components of PEs, 88% of adolescents had no hallucinations, 11% had minor hallucinations, and 2% had moderate-to-severe hallucinations (N=4499). Delusions in children aged 14 (N= 3659) were more prevalent, 55% had no delusions, 39% had mild and 5% moderate-to-severe delusions.

Looking at age 10 and 14 (N= 3441), 62.5% of children did not report hallucinations in either time period, 25.4% of children remitted from an experience at age 10, 5.5% of children had incident hallucinations at age 14, and 6.6% of children have persistent hallucinations between the ages 10-14 years. Further, of those children with hallucinations at age 10, 20.5% persisted and 79.5% remitted, as shown in Figure 3.

Table 1: Demographic information in the PEs sample

	N	*Characteristic*	*Value*
Child	3523	Sex (Female)	53.3%
		Mean age at assessment	13.5
		Mean age at adolescent PEs assessment(SD)	13.5(0.42)
		Maternal Education	
		Low	4.1%
		Medium	36.0%
		High	59.9%
		Maternal Ethnicity	
		Dutch	68.8%
		Non-Western	21.7%
		Other-Western	9.1%
		Household Income[1]	20.1%
		Maternal psychotic symptoms[2]	
		Median symptoms sum[3] (IQR)	0 (0.2)
		PEs at age 14	
		No PEs	52.1%
		Mild PEs	43.6%
		Moderate-to-Severe PEs	4.3%

[1](below 2300 euros per month at birth of child), [2]measured by BSI scales, [3]Psychoticism and Paranoia scales

Intraclass Correlation

We ran a multilevel model in order to evaluate the effect of the predictor variables on PEs at age 14, while accounting for neighborhood clustering. For the outcome measures of PEs, the neighborhood clustering explained very little variance of adolescent psychotic experiences (ICC = 0.001). Similarly, for delusions, belonging to a neighborhood accounted for a negligible parcel of variation (ICC = .01). In contrast, for the outcome measure of hallucinations, there was a sizeable portion of variation accounted by neighborhood

clustering, ICC = .535. When inspecting hallucinations, the variation accounted by neighborhood clustering adds to the association observed. Therefore, we proceeded with the multilevel analysis for all three outcome measures.

We conducted tests to verify the data complied with the assumptions for a logistic regression. There was no multicollinearity, given correlations between the independent variables in each model were under .90 and Variance Inflation Factors (VIF) were far under the value of 10.

Main Analysis

Table 2 reports all the individual ORs in each multilevel-logistic regression model describing the association between the predictors Social Cohesion, Living Conditions, Objective Safety, and Perceived Safety, and PEs. There was no significant relationship of neighborhood factors with PEs, shown by Model 1. The addition of the social covariates did not produce a change in the model, nor did the addition of maternal psychopathology. Thus, in Model 3, controlling for all the covariates and accounting for neighborhood variability, there was no evidence of the influence of these neighborhood level variables on mild or moderate-to-severe psychotic experiences at age 14. Separating the PEs into the hallucination and delusion, there was still no association to the neighborhood variables, as shown in Table S6 and S7.

Table 2: Multilevel logistic regression of the association of neighborhood factors with PEs

	PEs Absent	Mild PEs		Moderate-to-Severe PEs	
Neighborhood characteristic		*OR (95% CI)*	*p*	*OR(95% CI)*	*p*
Social Cohesion					
Model1	Ref	0.99 (0.93-1.06)	0.82	0.95 (0.80-1.12)	0.52
Model2	Ref	1.00 (0.93-1.07)	0.91	1.02 (0.85-1.23)	0.79
Model3	Ref	1.00 (0.93-1.07)	0.92	1.03 (0.85-1.23)	0.78
Living Conditions					
Model1	Ref	0.97 (0.90-1.04)	0.33	0.86 (0.73-1.02)	0.09
Model2	Ref	0.97 (0.90-1.04)	0.39	0.95 (0.79-1.14)	0.58
Model3	Ref	0.97 (0.90-1.04)	0.41	0.96 (0.80-1.15)	0.64
Perceived Safety					
Model1	Ref	0.97 (0.91-1.04)	0.38	0.90 (0.76-1.07)	0.25
Model2	Ref	0.97 (0.90-1.04)	0.41	0.99 (0.83-1.19)	0.91
Model3	Ref	0.97 (0.90-1.04)	0.42	0.99 (0.82-1.19)	0.91
Objective Safety					
Model1	Ref	1.02 (0.95-1.09)	0.61	1.05 (0.89-1.24)	0.56
Model2	Ref	1.02 (0.95-1.10)	0.50	1.14 (0.95-1.37)	0.16
Model3	Ref	1.02 (0.96-1.10)	0.49	1.14 (0.95-1.37)	0.16

Models progressively add more covariates. Model 1 is adjusted for age and sex, Model 2 is also adjusted for ethnicity, maternal education, income, Model 3 is adjusted for maternal psychopathology

Specificity Analysis

In order to find out if any association was exclusive to psychotic symptomatology, we ran the same analyses as above with the outcome depressive symptoms. Table S8 reports all the individual ORs in each multilevel logistic regression. We found that Living Conditions was associated with an increased risk of severe depressive symptoms in 14-year-olds when controlling for covariates, OR= 0.88 (0.78-0.99), p = .032. Risk of severe depression symptoms was 23% lower in children who live in neighborhoods where satisfaction with housing is high. When controlling for multiple testing, this association was no longer significant, p = .128.

With regards to the predictor Objective Safety, there was also an effect on moderate-to-severe depression symptoms at age 14, OR = 0.85 (0.75-0.96), p = .01. When controlling for all covariates in Model 3, this association did not remain significant, however it demonstrated the same trend, OR = 0.90 (0.79-1.01), p = .078.

Persistence Analysis

We found that a majority of the neighborhood factors had no effect in altering the risk for having remitted, incident or persistent hallucination. Table 3 includes all the individual ORs in each multilevel-logistic regression model for the outcome PE trajectory. Participants who lived in a neighborhood with poorer Living conditions had a higher risk of having remittent PEs, OR = 0.93 (0.861-1.01), p = .077. When controlling for all covariates, the association of living conditions with remitted hallucinations remained, OR = 0.91 (0.84-0.99), p = .026. The odds of having Remittent PEs increase 9% when children live in neighborhoods with low housing satisfaction. When controlling for multiple testing, the finding was no longer significant, p = .104.

	Absent (N=2152)	Remitted (N=872)		Incident (N=190)		Persistent (N=228)	
		OR (95%CI)	*p*	*OR(95% CI)*	*p*	*OR(95% CI)*	*p*
Social Cohesion							
Model1	Ref	0.98(0.91-1.06)	0.658	0.91(0.77-1.08)	0.290	0.99(0.84-1.16)	0.862
Model2	Ref	0.97(0.89-1.05)	0.419	0.98(0.82-1.17)	0.835	0.93(0.83-1.05)	0.268
Model3	Ref	0.97(0.89-1.05)	0.423	0.98(0.82-1.16)	0.840	1.01(0.86-1.19)	0.897
Living Conditions							
Model1	Ref	0.93(0.86-1.01)	0.077	0.90(0.76-1.06)	0.201	1.00(0.85-1.17)	0.965
Model2	Ref	0.91(0.84-0.99)	**0.025**	0.98(0.82-1.17)	0.800	1.02(0.87-1.21)	0.779
Model3	Ref	0.91(0.84-0.99)	**0.026**	0.98(0.82-1.17)	0.814	1.03(0.87-1.21)	0.768
Perceived Safety							
Model1	Ref	0.97(0.90-1.05)	0.497	0.95(0.80-1.12)	0.518	1.03(0.88-1.21)	0.691
Model2	Ref	0.95(0.88-1.04)	0.271	1.03(0.86-1.23)	0.738	1.06(0.90-1.25)	0.454
Model3	Ref	0.95(0.88-1.04)	0.274	1.03(0.87-1.24)	0.719	1.07(0.91-1.25)	0.443
Objective Safety							
Model1	Ref	0.99(0.91-1.07)	0.777	0.90(0.77-1.04)	0.154	1.04(0.89-1.22)	0.653
Model2	Ref	0.98(0.90-1.06)	0.591	0.95(0.81-1.12)	0.518	1.06(0.90-1.24)	0.510
Model3	Ref	0.98(0.90-1.06)	0.599	0.95(0.81-1.12)	0.527	1.06(0.90-1.24)	0.498

Table 3: Multilevel logistic regression of the association of neighborhood factors with PEs trajectory

Discussion

The current study examined neighborhood characteristics in an urban context, and their relation to the development and trajectory of PEs in adolescence. To summarize, contrary to what we expected, we did not find an association between neighborhood characteristics including safety, perceived safety, social cohesion, and living conditions, and psychotic experiences in adolescence. We did find limited evidence that children who live in neighborhoods where housing satisfaction is low are more likely to have PEs at age 10 followed by remission at age 14, compared to children who live in neighborhoods with high housing satisfaction. Although there was no association with psychotic experiences, we found limited evidence that adolescents who live in neighborhoods where housing satisfaction is low are more likely to display depressive symptoms at age 14.

In contrast to our findings, previous research has shown associations of neighborhood safety and social characteristics with clinical and self-rated PEs in children (Karcher et al., 2020; Newbury et al., 2016), and adolescents (Newbury et al., 2018; Solmi et al., 2017, 2020). These associations remained even when controlling for many relevant individual factors, such as household income and family history of psychopathology (Solmi et al., 2020). We propose methodological differences could explain why this association was not found in this study.

As a new methodological precaution, we accounted for clustering within the 71 neighborhoods, using a multilevel model design. Previously, other studies used neighborhood measures clustering areas into groups within a given characteristic, ie: Highest social cohesion, middle, lowest social cohesion (Newbury et al., 2016, 2018; Solmi et al., 2020). Due to the fact other studies did not account for area-level neighborhood clustering, the association between the factors and PE is vulnerable to potential third variables which could bring about the association. Neighborhoods which have a similar level of social cohesion could also share other attributes at the individual level and neighborhood characteristics level such as low household income, low highest achieved education, and low access to common spaces and facilities.

Further, the neighborhood measures taken from the Wijkprofiel were drawn from a community-based sample, which was independent from Generation R cohort. In prior studies (Newbury et al., 2016; Solmi et al., 2017), although census data was included, the neighborhood factors which show an effect both were rated by the mothers of the

participants, and by the direct neighbors surrounding the residency of the participants (Newbury et al., 2018). This means although the measure refers to the neighborhood-level, it is still captured through the lens of the participant's family and direct neighbors.

This highlights the potential importance of perception of the neighborhood as a factor contributing towards the association with PEs. Children and adolescents' perception of neighborhood is explicitly examined through other studies which found an association with PEs (Narita et al., 2020; Newbury et al., 2017) and psychopathology in general (Meltzer et al., 2007). Therefore, it may be the case that the participants' experience of the safety moderates the distress which they perceive in a safe or unsafe neighborhood. In this case, within one same neighborhood, individuals could still perceive different levels of threat, and this threat perception may be associated with the observed higher likelihood of PEs. Therefore, according to our evidence, it may not be the objective characteristics of a neighborhood or collective climate which are associated with PEs, but the individual perceptions of the neighborhood.

Our analysis on the trajectory of PEs had the goal to examine whether there was an association between neighborhood characteristics and the persistence of PEs between the ages 10 and 14 years. We found no evidence for the association between neighborhood and persistence of PEs. Literature on the trajectory of PEs is scarce (Havers et al., 2019; van Os et al., 2009), and few studies have examined the relation between neighborhood factors and persistence of PEs within adolescence (Solmi et al., 2017; Zammit et al., 2013). These studies showed different factors had an influence at age 13 and 18: Neighborhood stress was related to PEs at age 13, while neighborhood disorder – a measure relating to the perceived safety – was related to PEs at age 18 (Solmi et al., 2017). These findings were not reflected in the current research, given our social and safety measures showed no association with the PE persistence. More research is needed in order to clarify the potential influence of neighborhood factors influencing PE trajectory through childhood, mid-adolescence and late-adolescence.

We did find limited evidence for the association of living conditions and the remittance of PEs at age 14. We found a trend such that children who live in neighborhoods where housing satisfaction is low are more likely to have PEs at age 10, followed by remission at age 14 compared to children where housing satisfaction is high. There was no evidence that living in a neighborhood where housing satisfaction is low changes the

likelihood of having incident PEs at age 14 or persistent PEs through ages 10-14. This could be due to the relatively lower sample size of children who belong in the incident and persistent groups, holding little power to detect differences.

The investigation of living conditions is novel for the field, however there is evidence that housing properties affect children's health (Bradley, 2015). This finding could suggest living conditions are associated with a milder instance of PEs: our sample shows children involved in this risk factor developed PEs in late-childhood, however remitted by mid-adolescence. Twenty percent of children have PEs, and 80% of those PEs subside between ages 12 and 18 (Zammit et al., 2013), suggesting that transient PEs may be a developmentally normal process. Living conditions may be associated with the occurrence of the mild transient childhood PEs. We did not find an effect of living conditions on PEs later at age 14, thus supporting the idea that the association is specific to the milder childhood PEs. The limited evidence however must be taken with caution, given it did not survive multiple testing correction.

We examined whether the association of neighborhood characteristics was general or specific to PEs by replicating our analysis with depressive symptoms. Studies have identified the influence of neighborhood on general mental health of children (Kingsbury et al., 2015; Meltzer et al., 2007; Xue et al., 2005), thus there may be a component of general stress influenced by these factors which increases psychopathology overall. The current evidence evaluating the links between neighborhood factors, psychotic, and depressive symptoms is mixed - where sometimes there is a specific or stronger association with psychotic symptoms (Karcher et al., 2020; Newbury et al., 2018), in other cases there is evidence of an association to both symptom dimensions (Solmi et al., 2017). When studied independently, depression does have an association with preceding social neighborhood factors (Choi et al., 2021). In this study, although we did not find an association to the likelihood of PEs in adolescence, we did find a trend that living in worse conditions was related to an increase in the likelihood of severe depressive symptoms.

There is mixed evidence in the support of the association of physical neighborhood attributes and depression (Galea, 2005; Kim, 2008). It has been suggested that the built environment and housing conditions may contribute to depression because living in poorer conditions leads to poorer health behaviors and health outcomes (Kim, 2008). This is the first study to our knowledge to examine a variable including housing satisfaction at the

neighborhood level. Our finding did not survive multiple testing correction, therefore, further research is required to clarify this new potential association.

Out of the factors we examined, living conditions is the only neighborhood characteristic related to the remittance of PEs, and additionally, to severe depressive symptoms. It is interesting to note living conditions would fit into the stimulation, discrepancy, and deprivation model as a deprivation factor, because it may lead to a less enriching environment (Vargas, Damme, et al., 2020). There's no clear relationship between the group of children who had remitted PEs and severe depressive symptoms. A recent study demonstrated that adolescents who have remitted PEs at age 14 have more internalizing problems than those who never had any PEs (Steenkamp et al., 2021), however, the relationship continues such that adolescents who have persistent PEs have even more internalizing problems than those who remit. Further analysis in the present study revealed that the PE trajectory is associated with different endorsement of depressive symptoms, $X^2(6) = 248.62$, $p < .001$. However, comparing the remitted group to the total sample, remitted adolescents do not present higher rates of severe depressive symptoms than the average of the sample. Therefore, there is no evidence of any relationship between remitted PEs and severe depressive symptoms. In sum, our findings suggest a relationship of neighborhood living conditions with both the psychotic and other psychopathological dimensions. This suggestion should be interpreted cautiously: when multiple-testing corrections was applied, none of the models was statistically significant.

Strengths and Limitations

The main strengths of this study are the large sample of urban youth and the comprehensive measures of neighborhood characteristics retrieved from the municipality. We were able to examine 71 neighborhoods within the city of Rotterdam, even though the number of children varied within each neighborhood. The Wijkprofiel is a comprehensive index of neighborhood information in Rotterdam, which made it possible to investigate social, safety and living conditions within this local community.

Another strength of this study is the use of multilevel models to best capture the hierarchical structure of the data, where there are multiple individuals belonging to one same neighborhood. The advantage of such methods is a more accurate estimate of the variance taking into account neighborhood clustering, and it is of note in this study we found evidence that living in different Rotterdam neighborhoods explained 55% of the variability in

hallucinations. This effect was not explained by the neighborhood characteristics explored in this study. Future studies could propose new theories as to what variables could account for this neighborhood-level variability. We suggest taking into account individual perceptions of social and safety neighborhood characteristics, since the previous studies found effects using measures intrinsically linked to the participants' perceptions.

Some limitations should be considered in the interpretation of this study. First, due to the observational nature of the study, no inferences can be made about causality. There have been discussions about the social causation vs social drift hypotheses: On one hand, there may be an influence of living in disadvantaged neighborhoods on the occurrence of PEs, while on the other, the predisposition to the psychotic spectrum may lead to social difficulties, for example unemployment, which lead to downward social mobility (Mossakowski, 2014). In the case of the children, these processes could be intertwined in quite complex way, involving the parents' psychopathology, social drift, and social causation. The symptoms observed in the children could be due to either or both social drift and causation. Previous studies have addressed the amount of nonshared environment versus genetic contribution to the occurrence of PEs (Solmi et al., 2020), and evidence is mixed regarding the direction of causality (social causation vs. drift) (Lee et al., 2020; Sariaslan et al., 2016). In this study, the association is prospective, where the neighborhood measure was taken temporally before the PE measure. However, the findings cannot be interpreted conclusively in any one causal direction.

Secondly, another limitation is the PE measure. The PE measure in this cohort was a self-report comprised only of a two-item measure for hallucinations, and a five-item measure for delusions. The two-item hallucination measure provides a limited insight into the occurrence of the symptom in children and adolescents. Moreover, the outcome measure of PEs leaves out symptom dimensions for paranoia and other intrusive thoughts which could comprise psychotic experiences. The self-report is additionally a limitation due to the potential inflation of the prevalence rate. However, self-reports have been shown to correlate well with clinician-rated outcomes (Kelleher et al., 2011).

Third, in this study, two-thirds of the participants lived in multiple neighborhoods throughout their lifetime, with approximately one third of the sample moving twice, and one third more than two times. For the children that remained in the same neighborhood, this means that there is a concentrated exposure period of years, whereas for those who moved

often, the exposure period could be as small as one year previous to the collection of the PE measure. Thus, the length of the exposure effects captured within the neighborhood variables vary greatly. Moreover, for the children who moved, the influence of each neighborhood is summed and intermingled over the years. Further investigation of the incremental effects of moving neighborhoods could not be explored within this study. Further investigations are suggested in order to take into account exposure time within a neighborhood, and neighborhood mobility.

Conclusion

Although there is much literature on more severe parts of the psychotic spectrum, the associations between neighborhood and psychotic experiences are as of yet rather understudied, especially in youth populations. For future research, we suggest clarifying the role of living conditions in the development of PEs and depressive symptoms, in order to find mechanisms that apply to general psychopathology versus the specific psychotic spectrum. We know that PEs in childhood and adolescence can lead to worse psychopathology throughout the lifetime (Newbury et al., 2017), and especially given the robust evidence for the influence of urbanicity on the development of the psychotic spectrum (van Os et al., 2010), neighborhood characteristics may be a ripe target for interventions addressing PEs during youth (Leventhal et al., 2015). Overall, the findings of this study do not suggest that living conditions, objective safety, perceived safety, and social cohesion are associated with the development of PEs in adolescence.

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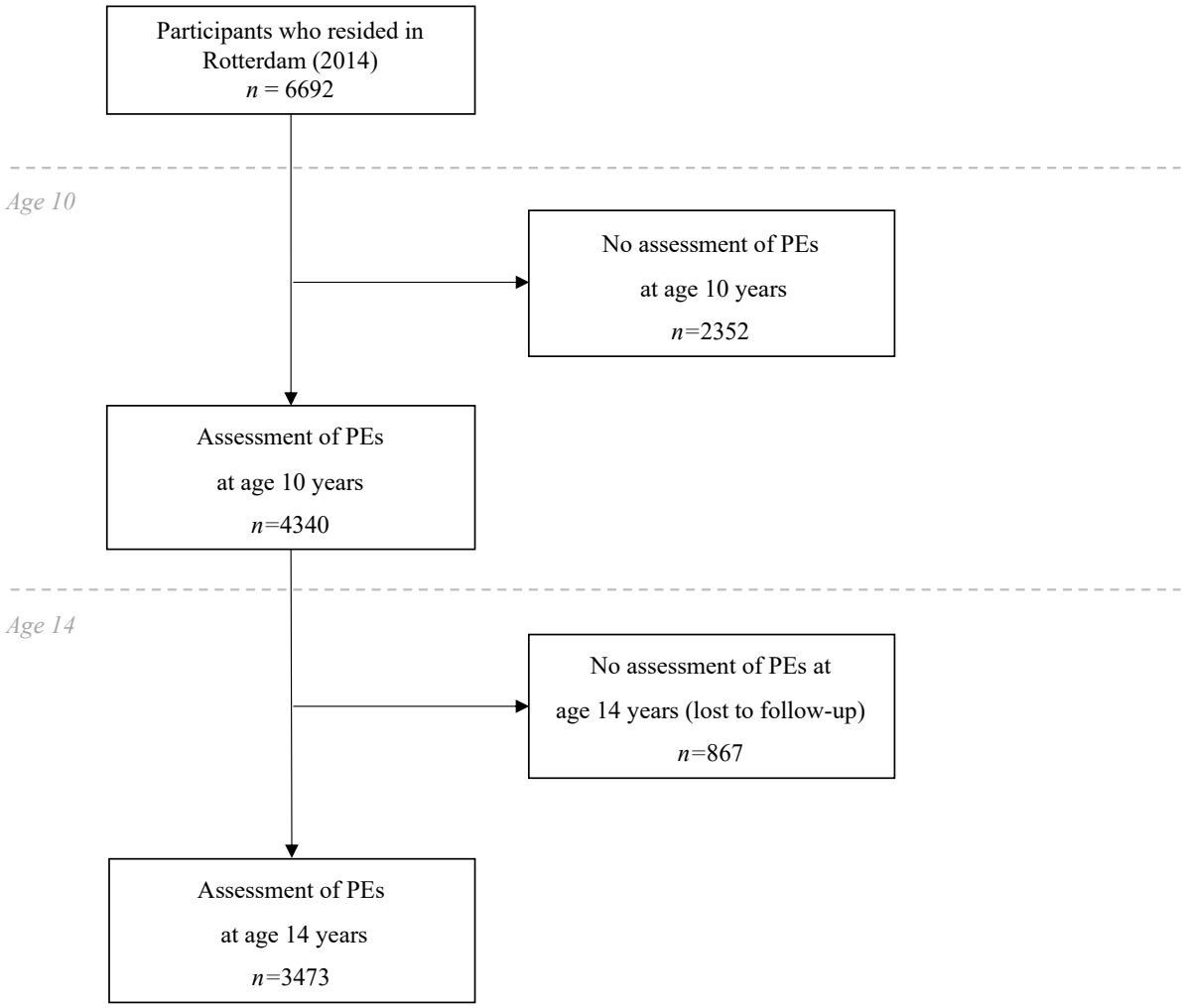
Appendix 1



Supplementary Figure 1: Flowchart of study inclusion for secondary aim

Appendix 2

Supplement Table 2: *Social Cohesion and Living Condition Scale Composition*

Social Cohesion	Living conditions
Measured by: Wijkprofiel selected items from: "Cooperation Subjective, Objective, Binding Subjective	Measured by: Wijkprofiel "Housing satisfaction and Housing Subjective [Woonbeleving /Wonen subjectief]"
%residents who say they are willing to take care of neighbors or friends who need help	% satisfied home overall
% of residents who say they are willing to take care of others in the area who need help	% satisfied with house size
% of residents providing neighborly assistance	% satisfied with housing type
% of residents who are active in a residents initiative	% satisfied with layout / floor plan
% of residents involved in making plans for the neighborhood or city	% satisfied with dimensions of storage space
% of residents that say that local residents know each other	% satisfied with the size of the outdoor space
% of residents that say that local residents spend a lot of time with each other	% satisfied with the view
% of residents that say local residents share each other's views	% satisfied with the isolation of outside noise
% of residents that say that local residents help each other	% satisfied with noise insulation from neighbors
% of residents that say they feel at home with local residents	% satisfied with heat insulation
	% satisfied with ventilation
% of residents say they like the neighborhood	% satisfied with the price- quality ratio valuation of buildings in the neighborhood
% of residents that say they feel connected to the neighborhood	% satisfied with entrance security
	% satisfied with safety storage

Appendix 3

Supplement Table 3: *Objective Safety and Perceived Safety Scale Composition*

Item composition Objective and Perceived Safety. Measured by:"Safety Objective [Veiligheidsindex -objectief] and "Safety Subjective [Veiligheidsindex -subjectief]"

Theft Objective	Violence Objective	Intrusion Objective	Vandalism Objective	Nuisance Objective
Number of crimes of Theft from / from motor vehicles per thousand inhabitants	Number of sex offenses per thousand inhabitants	Number of burglary crimes per thousand addresses	Number of vandalism or property damage crimes per thousand inhabitants	Number of reports of Security and Public Order - Drugs case per thousand inhabitants
Number of motor vehicle theft offenses per thousand inhabitants	Number of crimes of overt violence against persons per thousand inhabitants	Number of burglary crimes in a box / garage / shed / garden house per thousand addresses	Small outdoor fires per hundred hectares	Number of reports from Environment - Conflict per thousand inhabitants
Number of crimes of theft of moped, mustache, bicycle per thousand inhabitants	Number of Crimes of Threat per thousand inhabitants		Average score of graffiti and graffiti private individuals in Product standardization	Number of reports from Environment - Nuisance from / by per thousand inhabitants
Number of Pickpocketing crimes per thousand inhabitants	Number of assault crimes per thousand inhabitants			
Number of theft off / from / from other vehicles offenses per thousand inhabitants	Number of street robbery crimes per thousand inhabitants			
Number of crimes of Other property crimes per thousand inhabitants	Number of Robbery crimes per thousand inhabitants			

Theft Subjective	Violence Subjective	Intrusion Subjective	Vandalism Subjective	Nuisance Subjective	Safety Perception
Bicycle theft often occurs as a neighborhood problem	Threats often occur as a neighborhood problem	Burglary in homes often occurs as a neighborhood problem	Scratching walls and / or buildings often occurs as a neighborhood problem	Nuisance caused by groups of young people in their own neighborhood is often experienced as a nuisance	% (very) satisfied with the neighborhood
Theft from a car is often a neighborhood problem	Violent crime often occurs as a neighborhood problem	Percentage of residents who have been the victim of Attempted burglary last year	Destruction of telephone booths, bus or tram booths is often a neighborhood problem	Young people arguing and or screaming in the street in their own neighborhood is often experienced as a nuisance	Average score for perceived risk of victimization in your own neighborhood
Car theft in own neighborhood last year as a percentage of the total number of cars	Bag theft with violence is often a neighborhood problem	Percentage of residents who have been victims of burglary last year	Destruction / theft from a car often occurs as a neighborhood problem	Nuisance from young people who bully or intimidate local residents in their own neighborhood is often experienced as a nuisance	Average score for perceived victim chance own neighborhood of someone else in the hh
Theft from a car in your own neighborhood last year as a percentage of the total number of cars	Percentage of residents who have been victims of bag theft with violence in their own neighborhood last year		Destroyed / broken benches, rubbish bins, etc. is often a neighborhood problem	Drug nuisance in your own neighborhood is often experienced as a nuisance	Average score for avoidance behavior
Bicycle theft in own neighborhood last year as a percentage of the total number of bicycles	percentage of residents have been the victim of violence in their own neighborhood in the past year		Percentage of residents who have been victims of other destruction in their own neighborhood last year	Running back and forth of drug addicts in your street is often experienced as a nuisance	
Percentage of residents who have been victims of other theft in their own neighborhood last year	Percentage of residents who have been victims of abuse in their own neighborhood last year		Destruction to / theft from a car from your own neighborhood last year as a percentage of the total number of cars	Trade in drugs on the street in their own neighborhood is often experienced as a nuisance	
Percentage of residents who have been victims of bag robbery without violence in their own neighborhood last year				Women and men who are harassed on the street in their own neighborhood are often experienced as a nuisance	

Nuisance by local residents is often experienced as a nuisance

Appendix 4

Supplement Table 4: Demographic information in the hallucination sample

	N	*Characteristic*	*Value*
Child	4499	Sex(Male)	51.4%
		Mean age at measure 2(SD)	13.6 (0.41)
		Maternal Education	
		Low	5.3%
		Medium	38.1%
		High	56.5%
		Maternal Ethnicity	
		Dutch	66.3%
		Non-Western	24.6%
		Other-Western	9.1%
		Household Income[1]	22.7%
		Maternal psychosis spectrum psychopathology[2]	
		Median Maternal Sum (IQR)	0 (0.2)
		Hallucinations at age 14	
		No hallucinations	87.5%
		Mild hallucinations	10.5%
		Moderate-to-Severe hallucinations	1.8%

[1](below 2300 euros per month at birth of child), [2]measured by BSI scales

Appendix 5

Supplement Table 5: Demographic information in the delusion sample

	N	*Characteristic*	*Value*
Child	3659	Sex(Male)	46.8%
		Mean age at measure 2(SD)	13.9 (0.6)
		Maternal Education	
		Low	4.1%
		Medium	36.2%
		High	59.7%
		Maternal Ethnicity	
		Dutch	68.4%
		Non-Western	22.2%
		Other-Western	9.4%
		Household Income[1]	20.6%
		Maternal psychosis spectrum psychopathology[2]	
		Median Maternal Sum (IQR)	0 (0.2)
		Delusions at age 14	
		No delusions	55.4%
		Mild delusions	39.3%
		Moderate-to-Severe delusions	5.2%

[1](below 2300 euros per month at birth of child), [2]measured by BSI scales

Appendix 6

Supplement Table 6: Multilevel logistic regression of the association of neighborhood factors with hallucinations

	PEs Absent	Mild PEs				Moderate-to-Severe PEs			
		OR	Low	High	*p*	*OR*	Low	High	*p*
Social Cohesion									
Model1	Ref	0.98	0.87	1.09	0.66	0.97	0.74	1.26	0.81
Model2	Ref	1.02	0.91	1.14	0.79	1.09	0.83	1.43	0.55
Model3	Ref	1.02	0.91	1.14	0.78	1.09	0.83	1.43	0.55
Living Conditions									
Model1	Ref	0.99	0.89	1.11	0.93	0.84	0.64	1.10	0.20
Model2	Ref	1.05	0.93	1.17	0.46	0.94	0.70	1.25	0.67
Model3	Ref	1.05	0.93	1.17	0.45	0.94	0.71	1.25	0.67
Perceived Safety									
Model1	Ref	0.96	0.86	1.07	0.43	1.00	0.77	1.29	0.99
Model2	Ref	0.99	0.89	1.10	0.82	1.08	0.82	1.42	0.58
Model3	Ref	0.99	0.89	1.10	0.84	1.08	0.82	1.42	0.57
Objective Safety									
Model1	Ref	1.00	0.90	1.12	0.96	1.02	0.79	1.32	0.85
Model2	Ref	1.05	0.94	1.18	0.37	1.18	0.91	1.55	0.21
Model3	Ref	1.06	0.94	1.19	0.35	1.19	0.91	1.55	0.20

Models progressively add more covariates. Model 1 is adjusted for age and sex, Model 2 is also adjusted for Ethnicity, Maternal education, Income, Model 3 is adjusted for Maternal psychosis symptoms

Appendix 7

Supplement Table 7: Multilevel logistic regression of the association of neighborhood factors with delusions

	PEs Absent	Mild PEs				Moderate-to-Severe PEs			
		OR	Low	High	*p*	*OR*	Low	High	*p*
Social Cohesion									
Model1	Ref	1.01	0.94	1.08	0.83	0.94	0.81	1.10	0.47
Model2	Ref	1.00	0.93	1.08	0.92	1.02	0.87	1.20	0.80
Model3	Ref	1.00	0.93	1.08	0.90	1.02	0.87	1.20	0.81
Living Conditions									
Model1	Ref	0.98	0.92	1.06	0.65	0.89	0.77	1.04	0.14
Model2	Ref	0.98	0.91	1.05	0.55	0.97	0.82	1.14	0.70
Model3	Ref	0.98	0.91	1.05	0.58	0.98	0.83	1.15	0.77
Perceived Safety									
Model1	Ref	1.05	0.98	1.13	0.16	1.01	0.87	1.17	0.88
Model2	Ref	1.05	0.98	1.13	0.17	1.09	0.93	1.28	0.30
Model3	Ref	1.05	0.98	1.13	0.17	1.09	0.93	1.28	0.29
Objective Safety									
Model1	Ref	0.99	0.93	1.07	0.85	0.90	0.77	1.04	0.15
Model2	Ref	0.99	0.92	1.06	0.71	0.97	0.82	1.14	0.73
Model3	Ref	0.99	0.92	1.06	0.72	0.97	0.83	1.15	0.75

Models progressively add more covariates. Model 1 is adjusted for age and sex, Model 2 is also adjusted for Ethnicity, Maternal education, Income, Model 3 is adjusted for Maternal psychosis symptoms

Appendix 8

Supplement Table 8: Specificity analysis of neighborhood factors using outcome depression

	Low depression		Moderate depression			Severe depression			
		OR	Low	High	*p*	*OR*	Low	High	*p*
Social Cohesion									
Model1	Ref	0.96	0.89	1.03	0.226	0.89	0.79	1.02	0.084
Model2	Ref	0.99	0.92	1.06	0.748	0.93	0.82	1.06	0.272
Model3	Ref	0.99	0.92	1.06	0.730	0.93	0.82	1.055	0.268
Living Conditions									
Model1	Ref	0.93	0.86	0.99	0.029	0.84	0.74	0.946	0.004
Model2	Ref	0.96	0.89	1.03	0.289	0.87	0.77	0.987	0.030
Model3	Ref	0.96	0.89	1.03	0.286	0.88	0.78	0.989	0.032
Perceived Safety									
Model1	Ref	0.96	0.90	1.03	0.273	0.93	0.83	1.047	0.230
Model2	Ref	0.98	0.92	1.06	0.674	0.96	0.85	1.076	0.472
Model3	Ref	0.98	0.92	1.06	0.677	0.96	0.86	1.08	0.512
Objective Safety									
Model1	Ref	0.91	0.85	0.97	0.007	0.85	0.75	0.96	0.010
Model2	Ref	0.94	0.87	1.01	0.109	0.89	0.79	1.01	0.073
Model3	Ref	0.94	0.87	1.01	0.110	0.90	0.79	1.01	0.078

Models progressively add more covariates. Model 1 is adjusted for age and sex, Model 2 is also adjusted for Ethnicity, Maternal education, Income, Model 3 is adjusted for Maternal psychosis symptoms