

Synopsis for EU-GEI WP5 Publication

Synopsis no.: S5.31
Preliminary title: Effects of built/physical environment on the brain structure of young people at high risk of developing psychosis
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Publication category: 3 Publications from a single work package involving only some parties (or in some cases only one party) in the Work Package
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Work Packages involved: WP5
EU-GEI Partners involved from whom candidate co-authors (<i>additional to working and writing group</i>) should be nominated: IoP and other interested centres within WP5

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Objectives (scientific background, hypothesis, methods, and expected results):

It is well established that urban upbringing doubles the odds of developing schizophrenia in adulthood (March et al., 2008; Vassos et al., 2012). Several studies have focused on social aspects of this relationship, such as social exclusion and mental health (Tost et al., 2015). A few studies have looked specifically at the association between physical features of the environment and mental health. For example, Maas and colleagues (2006) demonstrated that the percentage of green space in people's living environment has a positive association with the perceived general health of residents. The relationship between specific features of the built/physical environment and psychosis is relatively understudied. This project aims at investigating neuroanatomical changes that are associated with urban living, focusing specifically on the built and physical environment, in people at clinical high risk (CHR) of psychosis and healthy controls using structural magnetic resonance imaging (MRI) scans.

A whole brain analysis as well as a region of interest (ROI) analysis will be carried out. Specifically, regions that were found to be associated with social stress will be included in the ROI analysis: hippocampus, amygdala, and the perigenual anterior cingulate cortex (pACC).

The following hypotheses will be tested:

1. Irrespective of the diagnosis, urban features (e.g. absence of green spaces, traffic, graffiti or litter) will be associated with altered total gray matter volume
2. Irrespective of the diagnosis, urban features (e.g. absence of green spaces, traffic, graffiti or litter) will be associated with altered gray matter volume in the chosen regions of interest.
3. The interaction diagnosis x urban features will reveal that UHR individuals have consistently more pronounced brain abnormalities than healthy controls in the chosen regions of interest.

References:

- Maas J, Verheij RA, Groenewegen PP, de Vries S, Spreeuwenberg P. Green space, urbanity, and health: how strong is the relation? *J Epidemiol Community Health*. 2006 Jul;60(7):587-92.
- March D, Hatch SL, Morgan C, Kirkbride JB, Bresnahan M, Fearon P, Susser E. Psychosis and place. *Epidemiol Rev*. 2008;30:84–100.
- Vassos E, Pedersen CB, Murray RM, Collier DA, Lewis CM. Meta-analysis of the association of urbanicity with schizophrenia. *Schizophr Bull*. 2012;38:1118–1123.
- Tost H, Champagne FA, Meyer-Lindenberg A. Environmental influence in the brain, human welfare and mental health. *Nat Neurosci*. 2015 Oct;18(10):1421-31. doi: 10.1038/nn.4108. Epub 2015 Sep 25.

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Data needed for the study: (please list the EU-GEI WP5 instruments)

Main analysis: data from CHR, and HC

- Baseline Structural MRI data
- Social and Environment assessment tool (only current postcode and scale 7 on Built/physical environment)

Covariates: data from CHR and HC

- Baseline socio-demographic data (e.g. age, gender)
- CAARMS baseline and follow-up to establish diagnosis
- SCID baseline and follow-up to establish diagnosis
- Indicators of socioeconomic status (subject and parental)
- estimate of IQ
- Mental illness in first degree relatives (FIGS)

Plan for statistical analysis (overall strategy):

Structural imaging data will be analyzed using a Voxel Based Morphometry approach. The effect of urban features on gray matter volume will be tested using multiple regression analyses with the different urban features as covariates of interest. The potential interaction between diagnosis and urban features will be tested using an ANOVA with diagnosis and centre as factor and diagnosis by urban features as covariate of interest. To account for possible confounds, gender, age, IQ, socio-economic status of subject and parents, mental illness parents will be included as nuisance covariates.

Other analyses/methods:

The built/physical environment section of the social environmental assessment tool is a 6-items questionnaire that measures the presence/absence of a number of physical features in one's environment on a 7-point Likert scale. Firstly, a factor analysis will be performed to identify factors in the questionnaire. Secondly, the correlation between factors and single items with brain structure will be tested.

Involvement of external Parties (non EU-GEI):

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IPR check (Intellectual property rights):
N/A

Timeframe:

Start date: Once WP5 data is available

Analysis: 4 months

Write up: 3 months

Additional comments:

N/A