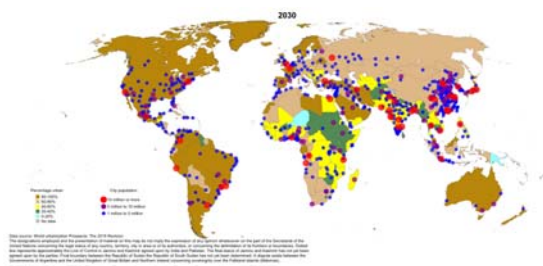


The city allure: 2030



<https://esa.un.org/unpd/wup/Maps/>

Is the association causal?

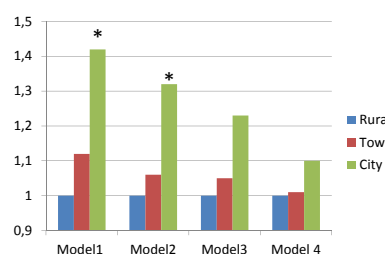
- ✓ Dose-response relationship
- ✓ Controlling for confounders
- ✓ Relocation associated with change in risk

Effects of social context

- Swedish birth and national patient register
- Outcome: any non-affective psychosis
- Individual variables: sex, education, parental ses, familial risk, foreign born
- School variables: based on averaging individual data re social fragmentation
- Municipality data: population density, deprivation, social fragmentation

Zammit et al, 2010

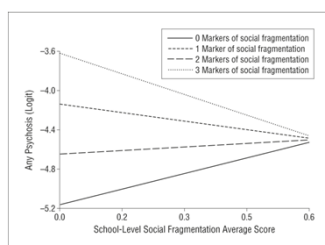
Contextual effects



Social fragmentation at school level explains urban effect

Zammit et al, Arch Gen Psychiatry. 2010;67(9):914-922.

Contextual AND individual effects



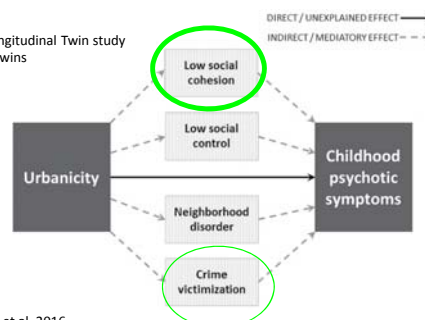
Cross-level qualitative interactions between individual and school

Being different increases risk of psychosis

Zammit et al, Arch Gen Psychiatry. 2010;67(9):914-922.

Neighbourhood effects

E-Risk Longitudinal Twin study
N=2232 twins



Newbury et al, 2016

Social capital

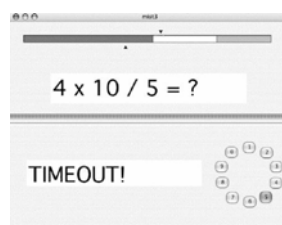
“those features of social organisations – such as networks of secondary associations, high levels of interpersonal trust and norms of mutual aid and reciprocity – which act as resources for individuals and facilitate collective action”

Kawachi et al 1999; Putnam 1993

Social evaluative threat

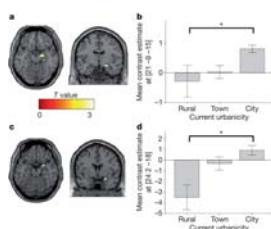
- Control condition: solving arithmetic without stress
- Experimental condition:
 - imposed time limit (10% less than average time)
 - indicators of subjects and average performance
 - feedback by experimenter

Montreal Imaging Stress Task



Dedovic et al 2005

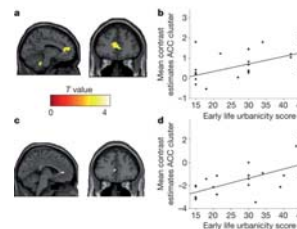
City living and brain function



Relationship between current urbanicity and amygdala activation during social stress task

F Lederbogen et al. *Nature* **474**, 498-501 (2011) doi:10.1038/nature10190

Urban upbringing and brain function



Relationship between early life urbanicity scores and pACC activation during social stress task

F Lederbogen et al. *Nature* **474**, 498-501 (2011) doi:10.1038/nature10190

City living and brain function II

Chronic stress-related dysregulation of the mesocortical dopamine system?



Krämer et al 2017

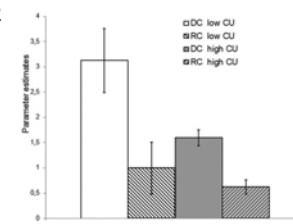
Desire-Reason-Dilemma paradigm

City living and brain function II

- N=147 (15 low CU, 132 high CU)

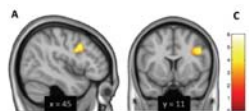
In High CU during conditioned reward :

- Reduced activation in VTA (fig)
- Increased activity in amygdala, medial OFC, pgACC



Krämer et al 2017

Urban upbringing and brain structure I

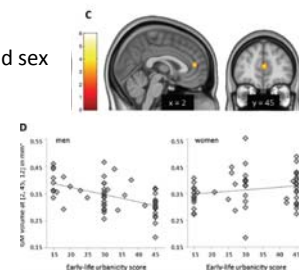


Significant correlation between urban upbringing and GM volume in right posterior DLPFC

N=110 healthy subjects
Haddad et al 2015

Urban upbringing and brain structure I

Interaction between urban upbringing and sex in pACC: males only



N=110 healthy subjects
Haddad et al 2015

Urban upbringing and brain structure II

Methods

- 89 patients with psychotic disorder
- 95 non-psychotic siblings
- 87 healthy controls
- Low / medium / high urban exposure from 0-15 years

Results

- Cortical thickness smaller in patients compared to siblings and controls
- No main effect of developmental urban exposure
- No group x urban effect

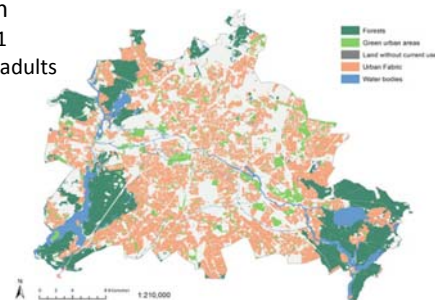
Frissen et al 2017

City living and brain structure

Berlin

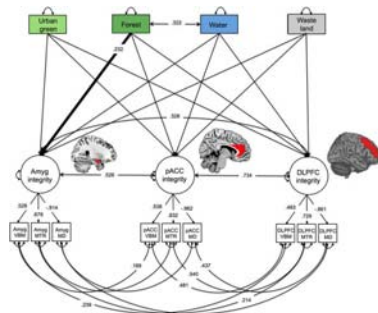
N=341

older adults



Kuhn et al, 2017

Living near a forest associated with amygdala integrity

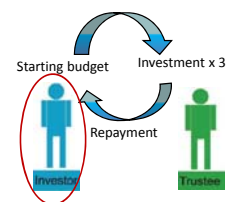


Kuhn et al, 2017

Trust and psychosis

Trust game:

- Two anonymous players
- Investor can invest a chosen amount
- Trustee can return any amount
- Investment reflects trust



Berg et al., 1995

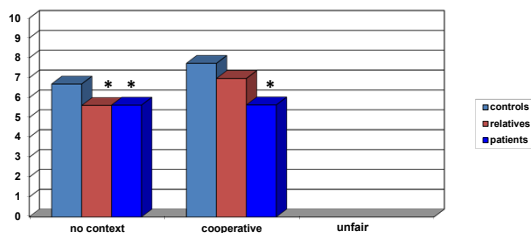
Trust game paradigm

1. No context game (5 rounds)
 - no information on partner's repayment
2. Context game (5 rounds)
 - information on partner style in the first game
3. Feedback game (10 rounds)
 - direct feedback on partner's repayment decision

Fett et al, Brain, 2012

Investments in the trust game

Relatives but not patients adjust their investment after prior information



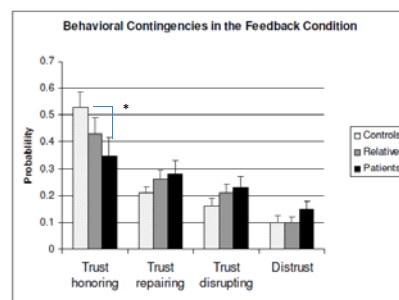
Fett et al, Brain, 2012

Patterns of interaction

	Partner returned more or equal	Partner returned less
Subject invests more or equal	TRUST HONORING	TRUST REPAIRING
Subject invests less	TRUST DISRUPTING	DISTRUST

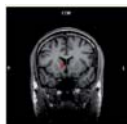
Fett et al, Brain, 2012

Lower trust and reciprocity in psychosis



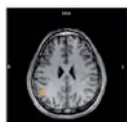
Fett et al, Brain, 2012

Neural mechanisms of trust in psychosis



Higher activation in caudate nucleus during cooperative interactions in controls

Reduced activation in patients linked to paranoid symptoms

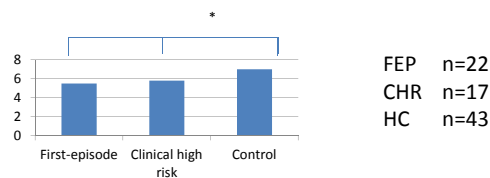


Higher activation in TPJ during cooperative and unfair interactions in controls

Gromann et al., Brain, 2013

29

Baseline trust affected in CHR and FE



FEP n=22
CHR n=17
HC n=43

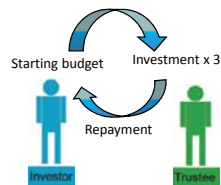
But no differences in adjustment to fair or unfair players

Jansen et al 2018

30

Urban upbringing and trust

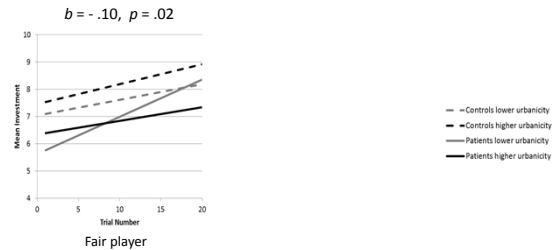
- FEP and CHR grouped together
- Urban upbringing from 0 to 15 years
- Dichotomized in final analyses
- Behaviour and fMRI



Jansen et al in prep

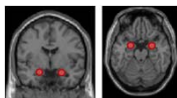
Effect of rural upbringing

3-way interaction

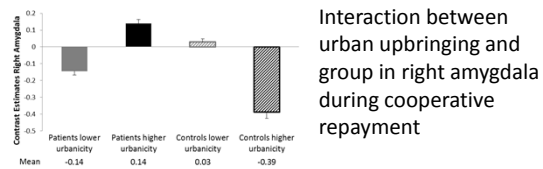


- No effect on baseline trust
- Rural upbringing associated with better adaptation in trust game

Brain activation and urban upbringing



- 8 ROIs, based on previous trust game studies



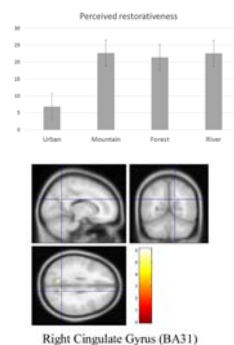
Viewing natural and urban landscapes



Tang et al, 2017

Effects on experience and brain activation

- Watching water and mountains had the strongest restorative effects (self-report)
- Brain activation patterns differed between urban>mountain and urban>water scenes, in cuneus and PCC



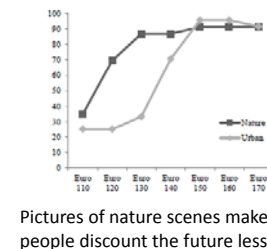
Tang et al, 2017

Immediate effects of nature temporal discounting



Percentage that prefers x in 90 days over 100 euros now

Lab study

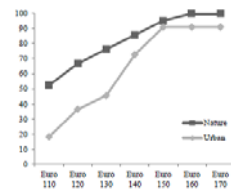


Van der Wal, van Vugt et al, 2013

Immediate effects of nature temporal discounting



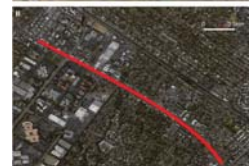
Field study



Walking through forest makes people discount the future less

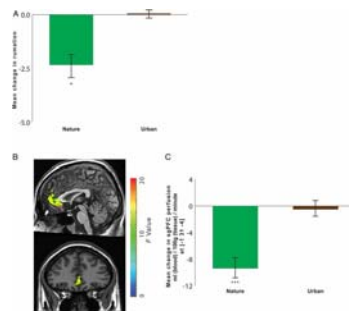
Van der Wal, van Vugt et al. 2013

Effects of a 90 min walk



Bratman et al 2015

Effects of a 90 min walk



Bratman et al 2015

Final notes

- Brain and behavior findings point to
 - social cohesion and (social) stress
 - restorative effects of nature
- Current and developmental urban exposure
- More detailed description of the exposure
- Experimental approaches