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Published in:
Psychosomatic Medicine

DOI:
10.1097/PSY.0000000000000473

Neighborhoods and health: Development and validation of an experimental manipulation of neighborhood characteristics in a virtual reality environment

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Introduction

- Neighborhood disadvantage is an independent predictor of health through material/psychosocial mechanisms.[1]
- Causal inferences can be limited due to conceptual and methodological challenges.
- Neighborhood disadvantage is hypothesized to influence health by inducing stress reactivity and negative emotion.[2]
- Effects of acute exposure may depend on prior socioeconomic status (SES), resulting in *habituation* or *sensitization*.

Project goals:

1. Develop and validate an *experimental model, in virtual reality (VR), of neighborhood disadvantage and affluence* to examine causal influences on emotion, behavior, cognition, and physiology.
2. Test the hypothesis that *neighborhood disadvantage elicits differences in emotion and stress reactivity*, and that this is moderated by childhood SES.

Methods

- 68 participants in Zürich, Switzerland: 50% Female, 22.7 years old (*SD* = 2.6), from 19 different countries
  - Education level: 39.7% graduate students/masters level, 58.8% undergraduate student/bachelors level
  - Parental education: 64.7% had at least one parent with a college degree or higher

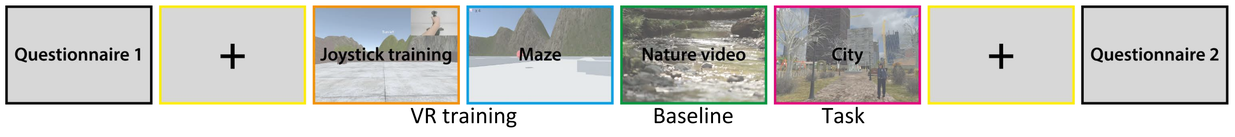
Affluent

Disadvantaged

Creating VR Neighborhoods and Experiment

- Design of VR environment based on systematic observations of real-world neighborhoods[3]
- Condition and level of deterioration (e.g., social/ physical disorder, graffiti, garbage, green space)
- Spatialized sounds used for different sections
- Human avatars constant across condition
- Participants randomized to neighborhood type
- Task: Follow route and collect "tokens"

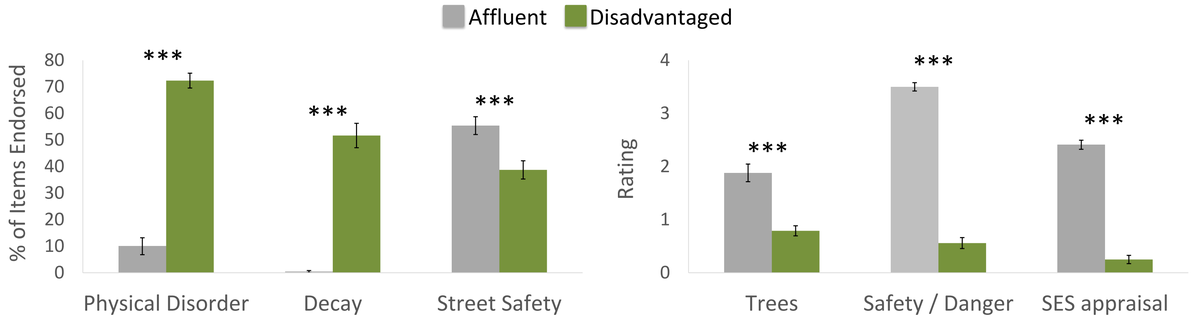
Procedure



- Measures:
  - Neighborhood perceptions: Systematic Social Observation (SSO) – iTour[4]
  - Emotion: Self-Assessment Manikin (SAM; Affect, Arousal) and specific emotions (e.g., fear, happiness)[5]
  - Stress reactivity: Blood pressure (BP; 3 minute intervals) and skin conductance level (SCL; continuous)
- Covariates examined: Video game use, gender, age, education, parent education and motion sickness

Results: Neighborhood Perceptions

- **Neighborhood type elicits significant differences in perception of neighborhood characteristics:**



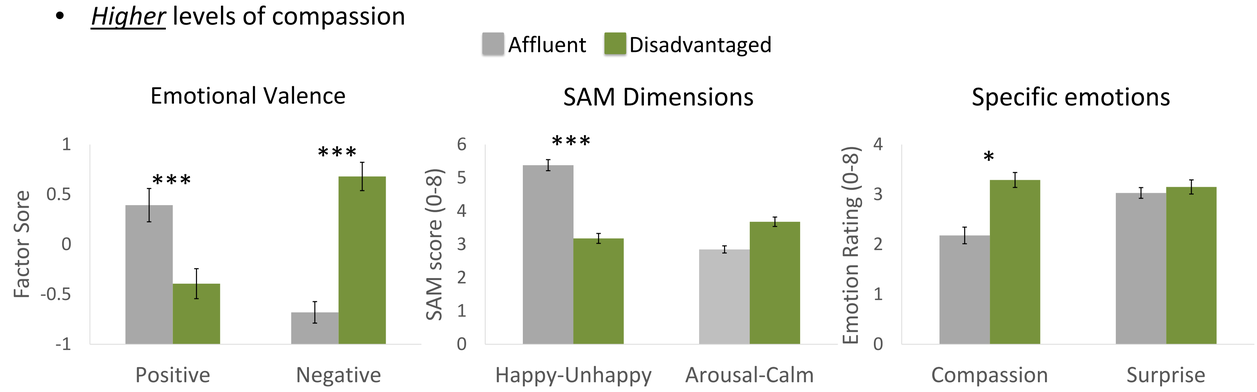
* p < .05, ** p < .01, ***p < .001

§ Analyses: Linear regression

- No differences in the perception of neighborhood characteristics held constant across conditions: Weather (p = .64) and Time of Day (p = .25)

Results: Emotional Responses

- **Neighborhood disadvantage elicits significantly different emotional responses**
  - *Higher* levels of compassion



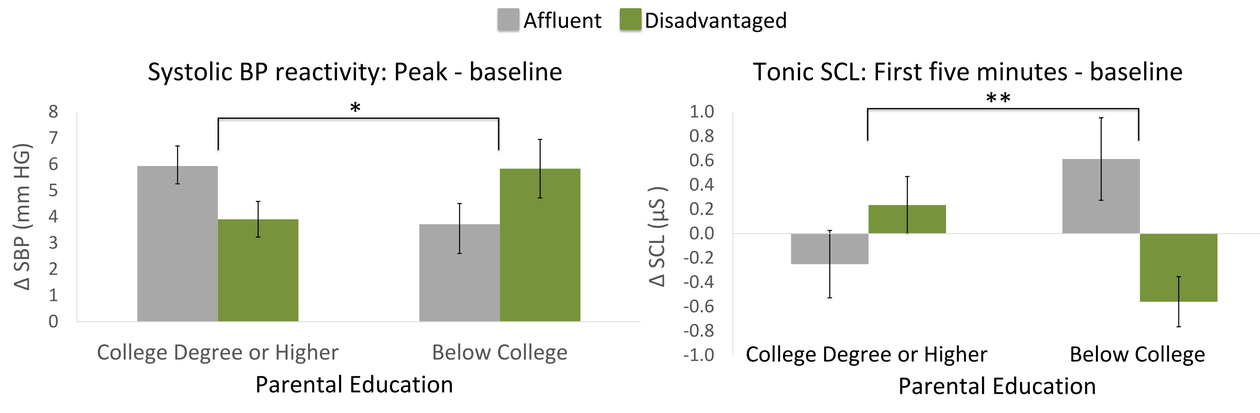
* p < .05, ** p < .01, ***p < .001

§ Analyses: Linear regression

- Emotional valence:
  - Two Factors: Positive (amusement, enthusiasm and happiness) and negative (anger, fear and sadness)

Results: Physiological Reactivity

- No main effects of neighborhood type on Systolic BP (SBP), Diastolic BP (DBP), skin conductance level (SCL), or non-specific skin conductance responses (nSCR)
- SCL analyses focus on first 5 minutes (SCL exhibits recovery prior to task completion)
- **Significant interactions between parental education and SBP, SCL and nSCR (all ps < 0.02)**



* p < .05, ** p < .01

§ Analyses: ANOVA with reactivity scores (neighborhood – baseline)

Summary

- Using VR to model neighborhood conditions is technically and conceptually feasible.
- Neighborhoods are perceived as distinct and reflective of disadvantage and affluence, varying in congruence with observations of neighborhoods differing in SES.
- Neighborhood disadvantage elicits more negative and less positive emotions.
  - Compassion is also increased when participants are exposed to greater disadvantage.
- There are no main effects of neighborhood type on physiological reactivity.
  - The influence of neighborhood type depends on childhood SES, even in an advantaged sample.
  - This interaction is system-specific: Evidence for both habituation (SCL) and sensitization (BP).

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