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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

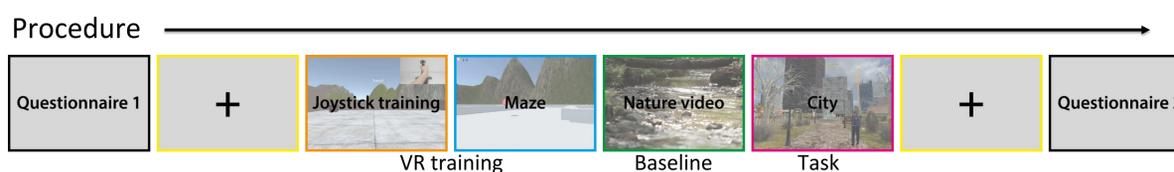
- 68 participants in Zürich, Switzerland: 50% Female, 22.7 years old ($SD = 2.6$), from 19 different countries
- Education level: 39.7% graduate students/masters level, 58.8% undergraduate student/bachelors level
- Parental education: 64.7% had at least one parent with a college degree or higher

Affluent

Disadvantaged

Creating VR Neighborhoods and Experiment

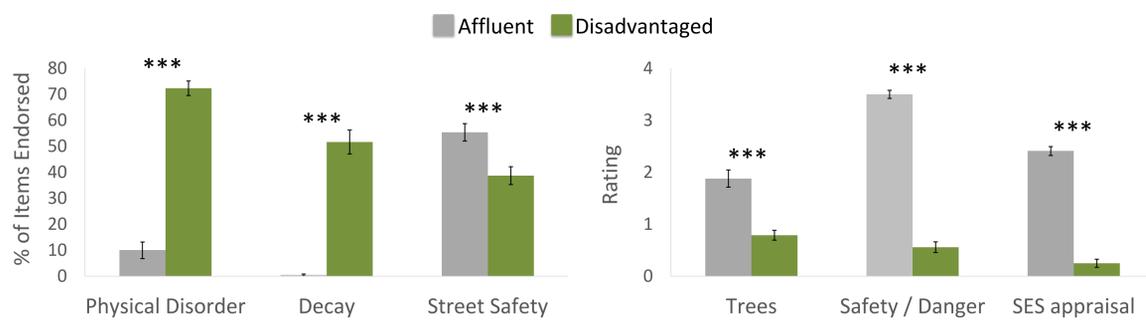
- Design of VR environment based on systematic observations of real-world neighborhoods³
- Condition and level of deterioration (e.g., social/physical disorder, graffiti, garbage, green space)
- Spatialized sounds used for different sections
- Human avatars constant across condition
- Participants randomized to neighborhood type
- Task: Follow route and collect "tokens"



- Measures:
 - Neighborhood perceptions: Systematic Social Observation (SSO) – iTour⁴
 - 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:**



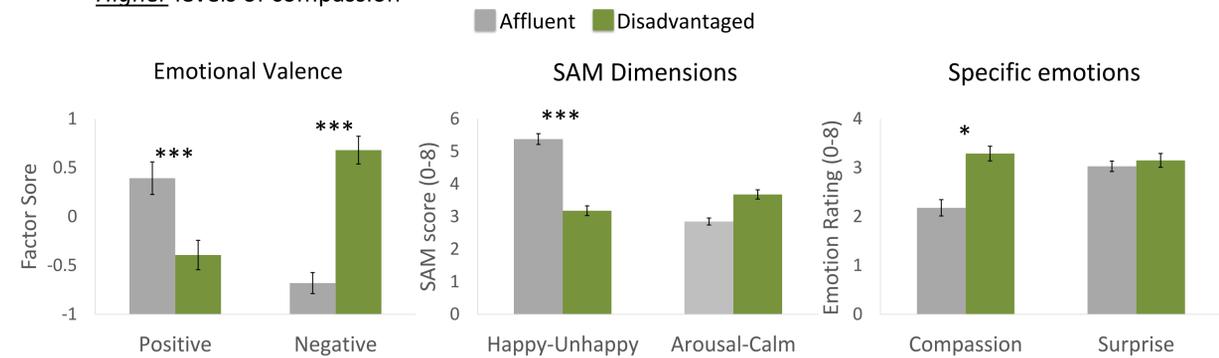
* $p < .05$, ** $p < .01$, *** $p < .001$

- 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

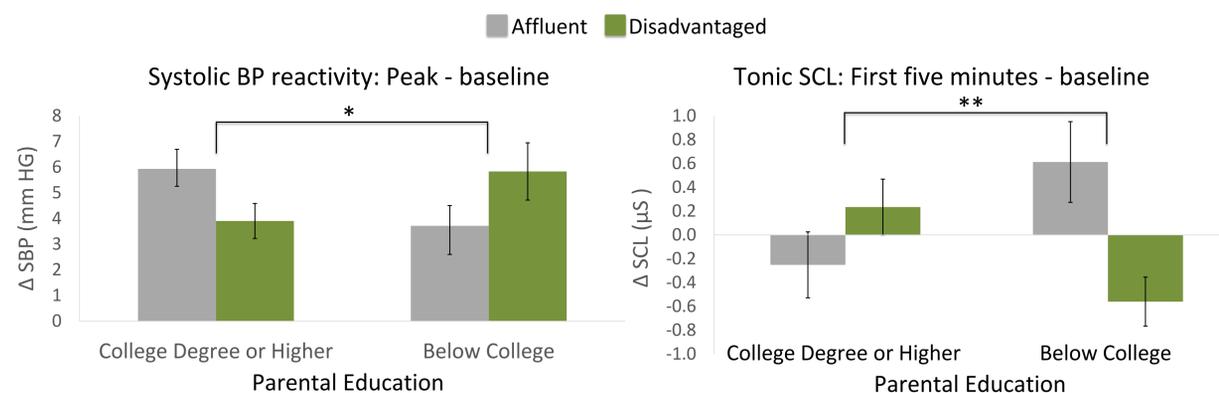


* $p < .05$, ** $p < .01$, *** $p < .001$

- 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 $ps < 0.02$)**



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

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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